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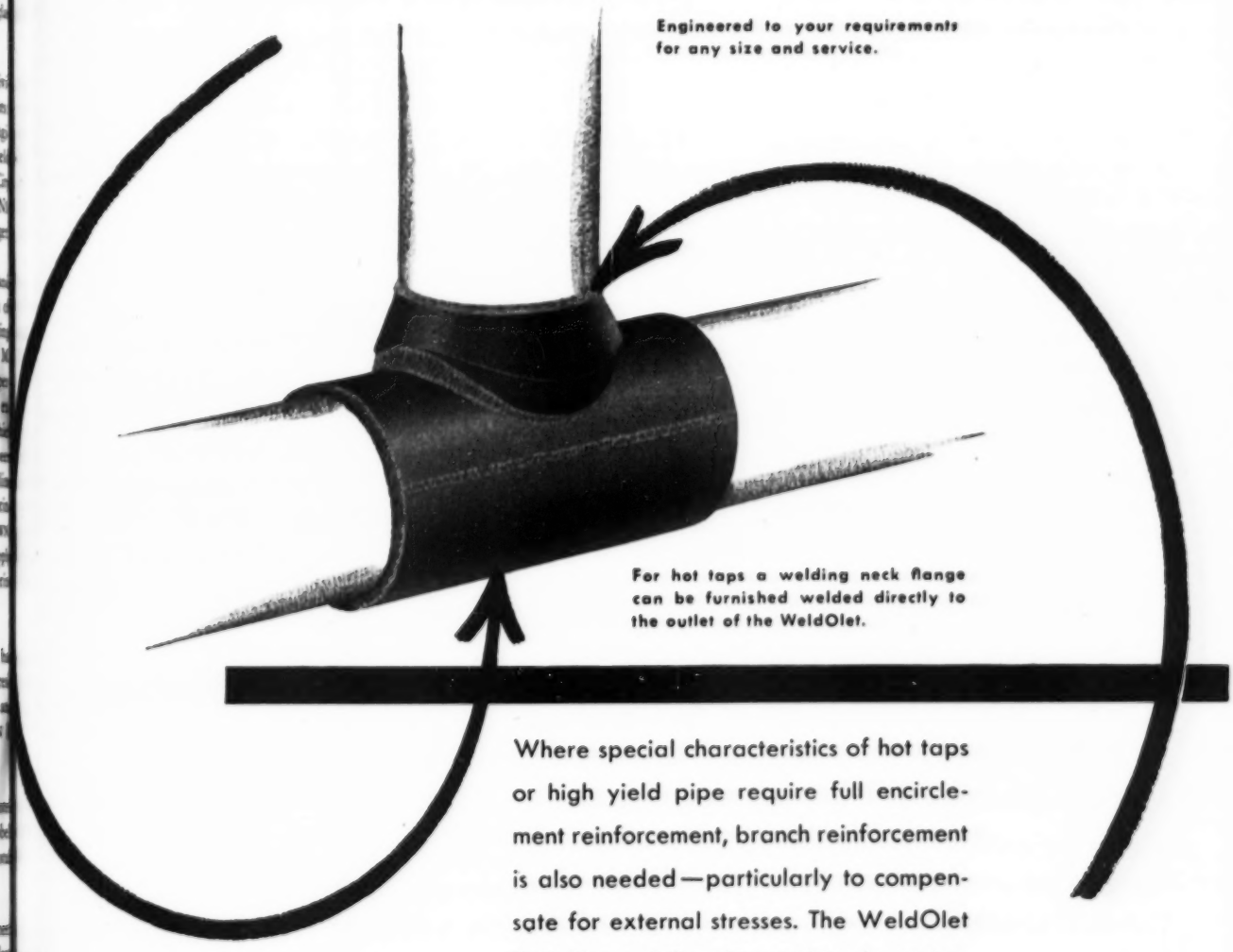

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GAS

30th Year of Publication

JULY 1954 · VOLUME XXX · NUMBER 7

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PAUL LADY, General Manager
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Editorial
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FRANK CHAPMAN, Editor
GUY CORFIELD, Technical Editor
BARBARA HALL, Managing Editor
L. D. FARRAR, Washington Editor
TRUDY SPRINGER, Editorial Assistant
RAYMOND A. GROTE, Art Director

Publication Office
198 South Alvarado St.
Los Angeles 57, California
Phone DUnkirk 7-4337

CHICAGO (1)
WILLIAM O. DANNHAUSEN, District Manager
333 North Michigan Ave.
FRanklin 2-4615

CLEVELAND (15)
FRANK J. ENRIGHT, District Manager
RICHARD L. De MUESY, Assistant District Manager
1836 Euclid Ave.
PRospect 1-4584

LOS ANGELES (57)
JOSEPH R. GERYK
198 S. Alvarado St.
DUnkirk 7-4337

NEW YORK (36)
PETER WILE, District Manager
Room 774, 11 West 42nd St.
CHickering 4-1969

TULSA
CRAIG ESPY, District Manager
2441 E. 25th Place
P.O. Box 4055
7-9807

GAS is published monthly by Jenkins Publications, Inc., 198 South Alvarado Street, Los Angeles 57, California. Subscription price: United States and possessions (in advance): 50 cents a copy; one year, $2.00; two years $3.00. All other countries: one year $4.00; two years, $7.00. Accepted under Section 34.64 P. L. & R. authorized. Member: Business Publications Audit of Circulation Inc., National Business Publications, Inc. GAS is indexed regularly by Engineering Index Inc. Publishers: BUTANE-PROPANE NEWS; Handbook BUTANE-PROPANE GASES; BOTTLED GAS MANUAL; Annual BUTANE-PROPANE Catalog WESTERN METALS. The name "GAS" is registered, U. S. Patent Office.

BPA

Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

Highlighting the News

U. S. gas to serve Northwest area

Pacific Northwest Pipeline Corp., which on June 18 got FPC authorization to build a $160 million pipeline from the San Juan basin in Colorado to the Pacific Northwest, will start building the 1466-mile line in September. Pacific Northwest President C. R. Williams estimates gas deliveries to the Northwest will begin by the fall of 1955. First deliveries are planned at a daily rate of 250 MMcf, increasing to 350 by the third year. FPC turned down the applications of West Coast Transmission Co. and Trans-Northwest Gas Inc. to serve the area with Canadian gas.

Phillips is fighting the Supreme Court's decision

First, Phillips will ask the court for a rehearing. If denied this, the company will lay its problem in the lap of Congress. No action is likely this semester, however.

Gas heating is still a wonderful market

Despite annual gains in the past few years approaching a million, 1953 saw an additional 1.2 million customers added and 1954's installations will be just as numerous, AGA predicts. So will 1955 and 1956. Today's total of 12.9 million represents 50.9% of total residential customers. (See page 70 for more complete report on AGA's survey.)

The big spending days are not over

Peoples Gas Light, Chicago, has filed with SEC for $40 million in bonds, part of a $113 million capitalization program for the remainder of 1954 and 1955. All but $29 million will be spent in the latter year. And Ohio Fuel Gas, Columbus, has announced a record $33 million outlay for 400 miles of line and facilities to take Gulf Interstate gas. Many more homes will thus be served with gas for heating by next winter.

Safety code to be ready by Dec. 1

So said Fred Hough of Southern Counties, testfying before the House Commerce Committee. Mr. Hough recommended that no action be taken on the Heselton bill to empower FPC to set up national safety standards for gas transmission until the industry has had a chance to comply with the terms of the code. Representative Heselton indicated he would not push the bill this year. However, both FPC's staff and the National Association of Railroad and Utilities Commissioners recommended that the bill be passed to unify regulations throughout the country.

Don't blame imports—gas is the culprit

T. S. Petersen, president of Standard Oil of California, told the Texas Railroad Commission that the "principal reason for failure of U. S. crude oil to find larger markets is not increasing imports, but increasing competition from natural gas and the liquids produced therefrom." Standard also announced it is cutting imports by 9600 bbl a day. Mr. Petersen also pointed to price differentials: gas at 10 cents is equivalent in heating value to oil at 60 cents a bbl (which now sells for $3).

An Eye on the Capital

Chaos

The 5-to-3 decision of the U. S. Supreme Court in the Phillips Petroleum Co. case hit both the natural gas industry and the Federal Power Commission with all the force of a judicial H-bomb.

Repercussions, of course, will be heard here for a much longer time than would the noise and reverberations of a super-weapon. The Congress, the White House and, of course, politicians of all parties will be talking—a lot of them puh-lenty—as a result of this decision for some time. A lot of them also will be involved in action to come, particularly on Capitol Hill, although not necessarily at this session.

The court's decision—upholding jurisdiction of the Federal Power Commission over natural gas producers—was against the FPC's own stand, of course. Furthermore, it posed grave new administrative problems for the agency, which has been in the midst of a combination political housecleaning and efficiency campaign. Until Congress acts—and, again, it does not appear likely that the legislature *will* act this close to adjournment—it seems evident that the FPC will be faced with a multitude of new duties, which its present majority did not want, and that these new duties will cause a consequent revision upwards of its expenditures for personnel.

For more details on the Phillips decision, see Pipeline Cover and News Section and a report from Phillips President Paul Endacott on page 103.

Chairman Jerome Kuykendall absolutely refused to comment to reporters on the ramifications—from the commission's standpoint—on the decision. He made it clear that his reticence was due to no lack of something to say, but that he wanted to take the subject up, at length, with all the commissioners before any statement would be issued. He made it clear that the decision, as broad as it was when finally made by the Supreme Court, was most

Thermally Thinking

surprising to him and to the other commissioners.

The majority opinion, by Justice Sherman Minton, made no attempt to limit the ruling to the Phillips Petroleum Co., or to any class or segment of the gas production industry. There was no provision for a holiday or transitional period, but the case has gone back to the FPC, which now must set up regulatory machinery to carry out the mandate of the high court.

The majority side went much farther than the ruling on the status of an independent producer when it held that the FPC has jurisdiction over all "wholesale sales," not merely over gas sales by producers to pipelines.

There was notable lack of statements, too, from the Republican side on Capitol Hill. Few Republican leaders come from states that are known primarily as producing areas, but, as noted here before, a lot of the more staunch ones come from states in which the consumers have been growing rapidly in recent years.

As a matter of fact, Sen. William Knowland (R.-Calif.), the Majority Leader, only a day or so after the Phillips decision, pointedly said he still is going to drive for July 31 adjournment, indicating that he was serving notice that no new legislation would get under the wire to crowd the heavy schedule the Senate already faces.

Minority Leader Lyndon B. Johnson (D.-Texas), significantly both from a heavy producing state and also up for a strong election fight pretty soon, came out swinging against the decision. He urged the President to call the representatives of the natural gas industry, the FPC, and other interested parties to draw up recommendations for the exercise of the new jurisdiction. At the same time, he let it be known that he thought Congress ought to act promptly.

Sen. Robert S. Kerr (D.-Okla.), who has authored legislation that would definitely have removed Phillips and other gatherers from FPC jurisdiction (this bill was vetoed by Harry S. Truman), blasted the Supreme Court decision as judicial law making.

It seemed apparent here shortly after the decision that a meeting between private industry leaders and federal leaders was essential. It was believed that the FPC, in its first public statement about the decision, would call such a meeting merely to explore the ramifications of the decision and to let both of its own officials and industry leaders know exactly what would be required.

Rayburn L. Foster, vice president and counsel for the Phillips company, told the Practicing Law Institute, in a speech shortly after the decision, that Congress would be called upon to undo what the Supreme Court had done. He said he felt sure that the decision would result in gas being held out of interstate movement, thus reducing the supply to the major consuming areas outside of the producing states and thereby increasing the cost.

President Dwight D. Eisenhower, who made friends with the oil and gas industry through his support of the so-called tidelands measure, is keeping a strictly hands-off attitude on the Phillips decision, and its ramifications. His closest ties in the House and Senate are with Republicans from the consuming states who have taken the "liberal" viewpoint on the natural gas industry. These men generally, while not issuing formal statements, have hailed the decision as one that will benefit the consumers.

On the other hand, Congressmen generally would just as soon not have a revived Kerr bill as an issue this fall, and it may be that the proposal to revive that legislation will wait until next January, when a new Congress takes over.

An issue saved for another day

The Senate likely has acted by now on the voluminous tax revision bill, and even before the Senate itself received the legislation, the Senate Committee on Finance had thrown out the scaling down of the so-called depletion allowance amendment sponsored by Sen. John J. Williams (R.-Del.) and Sen. George R. Aiken (R.-Vt.).

This attempt to cut the depletion allowance, in committee, likely was not the last to be made, however. It seemed certain that a floor fight on the issue would take place, but that it could be defeated handily, as it has been in other years.

However, the big spread given to this subject in the labor press—ranging from the big labor organs here to the small ones in the hinterland that parrot the words of the big boys—gives an indication that this fight will be joined again in the next Congress.

If there is one thing you can say for the brethren who are fighting to hamstring the natural gas industry—or almost any industry—it is that they never give up. They keep up a drumfire of misrepresentation from early morning to midnight, unless voter resistance is worn away and until many people actually accept as gospel arguments that might be demolished easily.

No embargo this year

A series of clashes took place here over protection of fuel industries and supply domestic consumers in the Pacific Northwest during hearings on the so-called Hunt Bill (S. 1287), introduced by the late Sen. Lester C. Hunt (D.-Wyo.), which would prohibit the importation or exportation of natural gas from Canada or Mexico, if economic "dislocation" would be caused by it. Incidentally, the bill will *not* likely get out of committee this year.

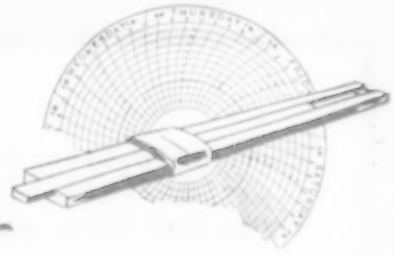
Both coal industry and union representatives, as could be expected, appeared on behalf of the Hunt Bill during hearings held by the Senate Committee on Interstate and Foreign Commerce. They asserted that importation of natural gas from Canada would bring unemployment and distress to the domestic mining industry. It cannot be denied that unemployment and distress already are apparent in the U. S. coal industry, but whether this is due more to the work of the competing industries or to the muddle-headedness of John L. Lewis in pricing coal out of the market is a moot question, too.

Senator Hunt told the hearing that his bill seeks to give the FPC a "clear, legislative basis for excluding foreign natural gas" when shown that domestic industry would suffer.

Through General Counsel Willard Gatchell, the FPC expressed the view that the bill should be amended to bring Section 3 of the Natural Gas Act into conformity with Section 7 (e). Oppo-

Continued on page 60

Technical Trends



• By GUY CORFIELD

The search for uranium

Uranium ore is the object of a continent-wide search, particularly in the mineralized areas of Canada and the western United States. The general incentive is, of course, the dual goal of world supremacy in atomic weapons, and peace-time development of industrial power to replace or supplement currently used fuel resources—and, to the individual, the attractive price of $1.50 per pound or higher for ore assaying at 0.1% uranium or better. Both professional and amateur prospectors, armed with Geiger counters, are combing the mountains and valleys looking for the dark brown or black pitchblende with its pitch-like luster or the varicolored carnotite, which are the two most important uranium-bearing minerals.

In the western United States particular attention is being paid to the Colorado plateau comprising the states of Wyoming, Utah, Colorado, Nevada, and New Mexico. As an item of direct interest to the gas industry it has just been annouced by Paul Kayser, president of the El Paso (Texas) Natural Gas Co. and the Western Natural Gas Co. of Houston, that the directors of these two companies have organized the Rare Metals Corp. of America for the purpose of exploring for and mining uranium and other rare metals, in connection with the research the two parent companies are actively conducting for natural gas over the Colorado plateau. El Paso and Western have purchased 300,000 and 100,000 shares respectively of Rare Metals Corp. stock, and are offering 100,000 shares to employees, all at a price of $1 per share. The employee participation has been arranged" to give employees the greatest possible incentive to promote the interests of the company." Mitchell H. Kline, formerly chief of the rare and precious metals branch of the U. S. Bureau of Mines and for the past five years in charge of exploration for uranium for the Atomic Energy Commission, will be assistant manager of Rare Metals Corp.

It is estimated that uranium resources are about 20 times as great as coal from the energy source standpoint, and that in the relatively near future, as efficiency of utilization improves and coal probably becomes more expensive, uranium will become competitive with and even replace coal for large power applications.

Ammonia from natural gas

The production of ammonia from natural gas using heat, air, steam and catalysis is becoming a progressively larger and more efficient operation. One of the latest additions is the 450-ton-per-day Phillips Chemical Co. unit at its Adams terminal on the Houston ship channel. In this plant the natural gas, after sulfur removal, is reacted with steam in a primary reformer furnace with nickel catalyst at 1175° F to form a mixture of carbon monoxide, carbon dioxide, hydrogen and some methane; air is then added as a source of nitrogen and the mixture goes to a secondary reformer where the remaining methane is converted; steam is then injected and the gas stream goes to an iron oxide catalyst monoxide reactor where the carbon monoxide and steam form carbon dioxide and hydrogen; carbon dioxide is then removed by scrubbing with monoethanolamine; the mixture is then compressed to 2000 psig and scrubbed with ammoniacal cuprous formate solution to remove residual carbon monoxide and oxygen; and finally the pressure is raised to 5200 psig for conversion of the hydrogen and nitrogen, by another iron oxide catalyst, into liquid anhydrous ammonia.

Obviously considerable compressor capacity is required for such processes. An interesting compressor combination is installed at Spencer Chemical's recently completed Vicksburg Works where a somewhat different partial oxidation process is used. This compressor, power for which is supplied by a Cooper-Bessemer 2000-hp GMW8 U-type natural gas engine, with 8 two-cycle, 18x20-in. power cylinders, handles three different gas streams simultaneously through horizontal compression cylinders arranged at right angles at either side. On one side, two-stage cylinders compress nitrogen at a rate of 2100 scf/min. from 25 to 310 psig, and on the same side a single-stage cylinder compresses 2190 scf/min. of methane (natural gas) from 100 to 400 psig. On the other side, two-stage air compressor cylinders raise 8600 scf/min. from 125 to 600 psig.

The Permian basin

The Permian basin is one of the nation's greatest oil and gas fields, covering an area of 250 miles wide by 300 miles long in west Texas and southeast New Mexico. It is now about 30 years old and its present producing area has been defined by the drilling of some 50,000 wells to depths varying from 1000 to 3000 ft.

To give some idea of the magnitude of operations in this field, in 1953 it produced 465 million bbl of oil and 850 MMcf of gas. Of this gas, 450 MMcf (as residue gas) were transmitted by El Paso Natural Gas Co. to California fuel markets, and 107 MMcf were burned to carbon black producing 146,000 tons of carbon; 46 million bbl of gasoline, butane, and propane were obtained; 160,000 tons of sulfur were produced (at gas purifying plants); the remainder was used for repressuring, gas-lift, plant fuel, etc.

Underground "salt jug" LPG storage (cavities in salt deposits, dissolved out by water) now exceed 3 million bbl in capacity. The latest estimate of reserves in this basin is 7 billion bbl of oil, about 22% of the nation's total.

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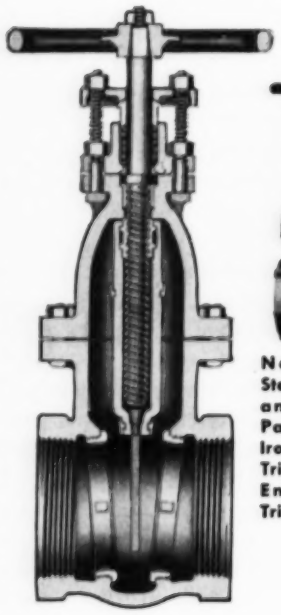

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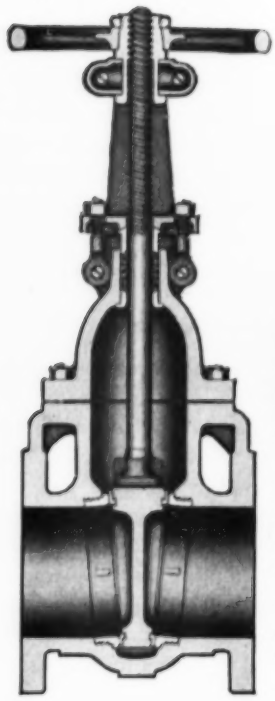

Outside Screw and Yoke; Screwed and Flanged Patterns; All-Iron or Brass Trimmed. Also available with brass seats and steel stem.

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Ten questions on distribution maintenance

By **ROBERT I. SNYDER** • Southern California Gas Co., Los Angeles

Mr. Snyder, manager of distribution.

ANY program for the maintenance of a distribution system should accomplish three basic objectives. First, of course, the program should result in the elimination of hazardous or potentially hazardous conditions. Second, it should keep gas losses to an economical minimum. Third, the program should ensure the perpetuation of the distribution system, i.e., provide for its continuing availability as a safe and efficient means of distributing gas.*

With this in mind, let's move on to a consideration of some of the questions concerning distribution maintenance that distribution executives should periodically ask about their own programs. Here are 10 that I believe are particularly important.

*These objectives were outlined in an article by Elting Henderson, Southern California Gas Co., entitled "A Management View of Distribution Maintenance," which appeared in the September 1953 issue of GAS.

1. *What are the maintenance requirements of the distribution system?* This is certainly the most important question to be asked concerning any maintenance program. Unfortunately, it typically is also the most difficult to answer. It involves consideration of a complex of variables—pipe type, corrosivity conditions, pipe coating effectiveness, pipe age, etc.—information regarding which is all too frequently inadequate or nonexistent. From such sketchy basic data, conclusions must be drawn as to the probable life expectancy of pipe of a certain type coating in certain soil conditions. This in general summary indicates the total major maintenance which is required now and in the future.

Our own experience with this question would indicate that the first answer is necessarily an approximation that must be reviewed and refined as more precise data become available. I imagine our early maintenance operations were typical of most companies'—hazard control and reduction of "unaccounted for" figures being of primary concern, with the long range implications of system perpetuation receiving little attention. In 1943, a comprehensive survey was made of the maintenance needs in our central division. Historic pipe retirement data (a mixture of retirement because of condition and for other reasons) was related to the ages of existing bare or poorly protected mains and the soil conditions in which they were located as indicated by general soil maps. Rough though it was, this inventory clearly revealed that the level of maintenance then in progress was inadequate and that this volume of maintenance work would progressively fall further and further behind indicated requirements.

This initial study was extended to cover the entire system and was the basis for a long range maintenance program as explained below. We are currently completing a more precise reinventory of current maintenance needs, based on more exact evaluations of pipe coating performance, and a more detailed survey of corrosion conditions and of pipe age. We are also undertaking a study of the maintenance which may be required on the newer coated mains, which, to date, have not been included in our basic long range program.

2. *What schedule of major maintenance should be undertaken?* The decision as to the rate at which major maintenance requirements should be met is a matter for top management concern. The answer affects not only distribution activities, but a program of any magnitude has an important bearing on the company's financial planning and may necessitate a reappraisal of the adequacy of current rates. The initial program may have to be a compromise between what is technically necessary and what is financially possible at the moment, although it is obvious that any company must ultimately be able to meet the long range requirement if it is to continue to stay in business.

Again, our experience indicates some of the complications that arise in scheduling maintenance activities. Based on the initial maintenance inventory discussed earlier and upon mortality data, soil surveys, etc., at hand in 1943, estimates of footages of replacements of bare pipe in corrosive soils were made for each of the following 25 years.

Needless to say, all data accumulated since 1943 have been and will continue to be utilized in revising annual estimates of the footage of mains which will probably have to be replaced. The original estimates, made in 1943, will consequently be revised upwardly or downwardly as additional facts are brought to light.

3. *Are the most economical maintenance aternatives being used?* Maintenance, in the sense used in this discussion, refers to any operation that maintains and extends the serviceable life of the distribution system: this definition of maintenance includes not only leak repairs, but reconditioning, replacement, and cathodic protection as well. Each of these alternative meth-

This article is adapted from a talk presented at the AGA distribution conference held in Montreal, April 20-23.

ods has its place in the overall maintenance picture.

The test in determining which one of these alternatives to use in a particular situation (assuming equal suitability with regard to hazard control) is cost as reflected in the company's earnings. Since each has a markedly different effect on the probable future maintenance requirements of the section of main in question, a comparison of direct costs alone is not enough. The immediate costs for a leak repair, for example, are substantially lower than those for reconditioning or replacing a section of main. Offsetting this lower immediate cost is the fact that a leak repair does nothing to prevent potential leaks in the adjacent section of the main, as does replacement or reconditioning. In view of this, a cost analysis of maintenance alternatives must be based on annual costs for the remaining life of the facility. Such an annual cost analysis reflects not only the immediate cost of each maintenance procedure, but its effect on the life expectancy of the main on which it is used.

Our own basic program is concerned primarily with bare and poorly protected pipe. At the moment, in view of the general condition of this pipe, the two procedures most generally suitable for our particular maintenance problem are repair and replacement (reconditioning and cathodic protection are still under consideration, however, as I'll discuss later). An economic analysis of repair vs. replacement in terms of annual cost must take into account the immediate cost of each, subsequent additional survey and maintenance costs which may be expected, and an estimate of the value of gas losses, all in relation to the net cost to the company as affected by interest rates and impact upon rate of return.

As you can appreciate, calculating the relative economics of repair vs. replacement for each situation encountered would be a complicated and time-consuming chore. Consequently, we have developed curves which show graphically the points of substantially equal annual costs for these two alternatives, based on various unit costs for repair and for replacement, and reflecting gas losses, capital costs, and indicated future maintenance requirements (see *Figs. 1* and *2*).

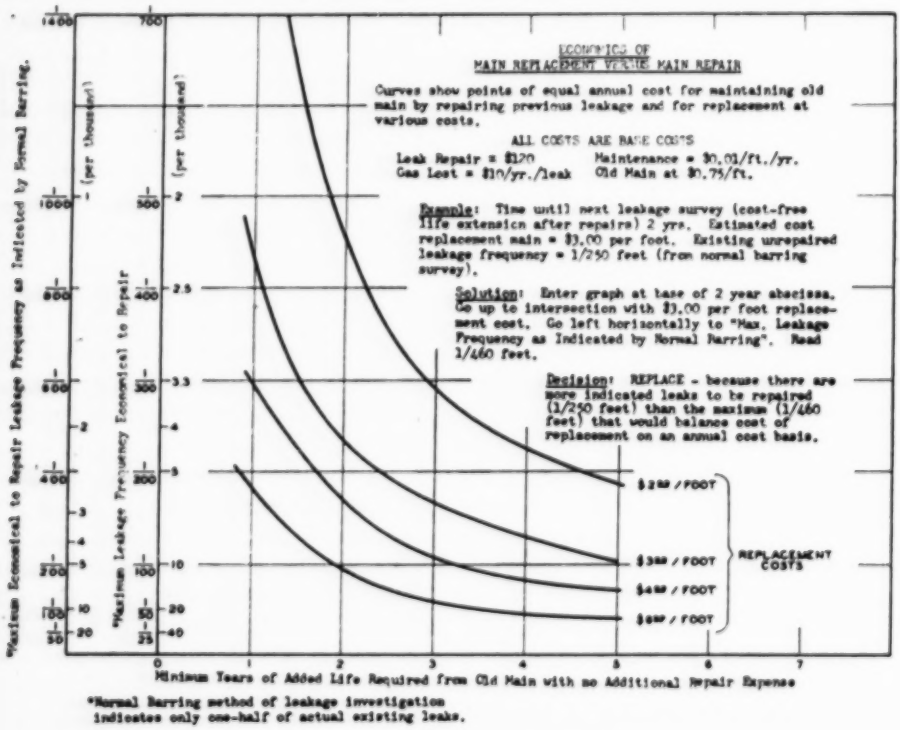
4. *Are the special maintenance problems presented by services recognized in the basic program?* Services present some unique problems which should be reflected in a long range maintenance problem. First, of course, the fact that services are typically so much closer to homes and buildings makes any leakage potentially much more hazardous. Second, surveys of service condition are more difficult to administer, both from an operating and public relations point of view. And third, significant economies can be obtained by doing any service maintenance work while main maintenance work is performed.

Our service replacement policy attempts to reflect these special considerations. A leak on a bare or poorly protected service in corrosive soil is usually not repaired, but the entire service is replaced. When a main is being replaced, our present policy calls for replacing, without test, any connected servise over 20 years old if soil resistance is 5000 ohm-centimeters or less. (All other services are tested prior to being tied-over to the new main and replaced on the basis of the results of these tests.) This policy is predicated on the likelihood of leakage occurring in the near future under these conditions, even if it does not now exist. This, coupled with the economies of replacement in conjunction with the main work, makes the replacement of a service even several years in advance of actual need an economically sound move.

We are currently revising this automatic replacement policy to incorporate consideration of the age of the main being replaced. Some services which are 20 years old or more are still many years younger than the main. Automatic replacement may be premature in such a case, since the actual leakage history of the main indicates that corrosion conditions are actually not so severe as indicated by soil resistivity readings. The policy now being formulated will take into account the age of the service in relation to the age of the main (and also the fact that service pipe wall thicknesses are less than main wall thickness) in determining whether or not the service will be tested or replaced automatically.

5. *Are the best surveys for system condition being used?* The development of annual maintenance program is based on a general determination of probable maintenance requirements—i.e., with the footage of pipe in the system, protected with various coatings, installed in various corrosion conditions, past experience has indicated that a certain amount will require major maintenance each year. This is a sound basis for the formulation of a basic program.

There are so many variables affecting actual pipe mortality, however, that a more detailed study is necessary to determine exactly which portions of the system require maintenance attention currently. Past experience will indicate those sections which most probably will have to be worked on, but generally a


ECONOMICS OF
MAIN REPLACEMENT VERSUS MAIN REPAIR
Curves show points of equal annual cost for maintaining old main by repairing previous leakage and for replacement at various costs.
ALL COSTS ARE BASE COSTS
Leak Repair = $120
Gas Lost = $10/yr./leak
Maintenance = $0.01/ft./yr.
Old Main at $0.75/ft.
Example: Time until next leakage survey (cost-free life extension after repairs) 2 yrs. Estimated cost replacement main = $3.00 per foot. Existing unrepaired leakage frequency = 1/250 feet (from normal barring survey).
Solution: Enter graph at base of 2 year abscissa. Go up to intersection with $3.00 per foot replacement cost. Go left horizontally to "Max. Leakage Frequency as Indicated by Normal Barring". Read 1/460 feet.
Decision: REPLACE - because there are more indicated leaks to be repaired (1/250 feet) than the maximum (1/460 feet) that would balance cost of replacement on an annual cost basis.
$2.00 / FOOT
$3.00 / FOOT
$4.00 / FOOT
$6.00 / FOOT
REPLACEMENT COSTS
Maximum Economical to Repair Leakage Frequency as Indicated by Normal Barring.
(per thousand)
Maximum Leakage Frequency Economical to Repair
(per thousand)
Minimum Years of Added Life Required from Old Main with no Additional Repair Expense

*Normal Barring method of leakage investigation indicates only one-half of actual existing leaks.

Fig. 1.

condition survey is necessary to locate those specific sections which most urgently require attention.

Like many companies, we have used the so-called barring survey for this purpose. Bar holes are drilled over the main and the atmosphere in the hole checked with a gas indicator for the presence and concentration of gas. The percentage of gas present and the pattern of gas indications along a section of main plus other data available are evaluated in terms of indicated pipe condition.

In 1949, a statistical analysis was made of the results of the various plans for this type of survey which were being used. Relating results to costs, it was determined that the most economical plan which gives valid results is to bar at 20- and 25-ft intervals (changing the base point and intervals in successive surveys), drilling holes directly over the main and to a depth 6 in. above the main. The period between barring surveys is based on the age of the main and the corrosivity of the soil in which it is installed.

Last year, we started a study on a modification of the barring survey which we hoped would give a sound basis for determining maintenance requirements and which would locate any hazardous conditions which would require immediate attention. A comparison of results of these modified surveys with those of normal surveys over the same mains is very promising. It appears that in many conditions, this modified survey procedure will provide adequate information, at a significantly lower cost. (Instructions for this modified survey are shown in *Fig. 3.*)

In addition to these condition surveys which are intended primarily to provide information for an economic analysis of maintenance requirements, we also conduct special "insurance surveys," the primary purpose of which is for hazard control maintenance. I'll tell you more about these surveys in relation to the next question.

6. Is hazard control receiving attention? One of the chief advantages in establishing a long range maintenance program is that it changes maintenance from a "fire-fighting, as-needed" activity to a planned and rational undertaking. The danger to be avoided is that the emphasis on long range planning may overshadow the problem of day-to-day hazard control.

It certainly is essential to have a long-term program and to assure that

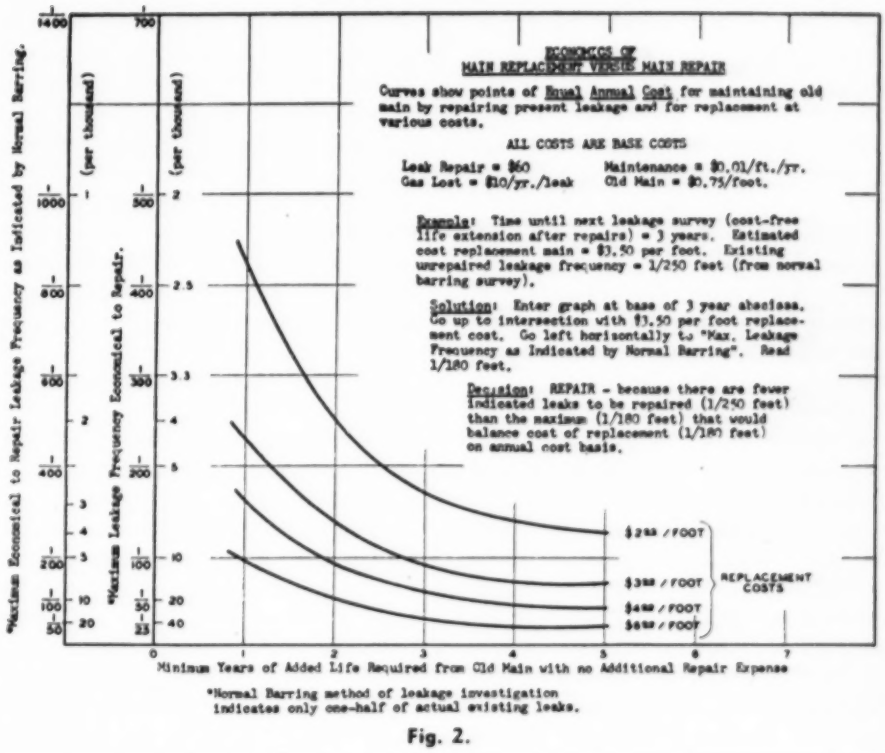

ECONOMICS OF
MAIN REPLACEMENT VERSUS MAIN REPAIR
Curves show points of Equal Annual Cost for maintaining old main by repairing present leakage and for replacement at various costs.
ALL COSTS ARE BASE COSTS
Leak Repair = $60
Gas Lost = $10/yr./leak
Maintenance = $0.01/ft./yr.
Old Main = $0.75/foot.
Example: Time until next leakage survey (cost-free life extension after repairs) = 3 years. Estimated cost replacement main = $3.50 per foot. Existing unrepaired leakage frequency = 1/250 feet (from normal barring survey).
Solution: Enter graph at base of 3 year abscissa. Go up to intersection with $3.50 per foot replacement cost. Go left horizontally to "Max. Leakage Frequency as Indicated by Normal Barring". Read 1/180 feet.
Decision: REPAIR - because there are fewer indicated leaks to be repaired (1/250 feet) than the maximum (1/180 feet) that would balance cost of replacement (1/180 feet) on annual cost basis.
$2.50 / FOOT
$3.50 / FOOT
$4.50 / FOOT
$6.50 / FOOT
REPLACEMENT COSTS
*Maximum Economical to Repair Leakage Frequency as Indicated by Normal Barring.
*Maximum Leakage Frequency Economical to Repair.
(per thousand)
Minimum Years of Added Life Required from Old Main with no Additional Repair Expense
*Normal Barring method of leakage investigation indicates only one-half of actual existing leaks.

Fig. 2.

day-to-day activities are carried on to the extent practical, consistent with overall economics and system perpetuation goals. On the other hand, the safety of the public it serves is of paramount concern to any gas company.

In our own program, in addition to setting up scheduling and dispatching procedures to assure immediate attention to any hazardous condition, we have established special "insurance" surveys to review the condition of the system in locations where hazard exposure is particularly high: near schools, in business districts where pavement exists from building to building, adjacent to hospitals and other public buildings. These surveys are more rigorous than the normal "condition" surveys, and are scheduled at more frequent intervals.

One aspect of this hazard control picture to which we have devoted considerable attention recently is the manner in which our dispatchers and field crews approach emergency incidents. Over a number of years, these people have handled so many incidents of this type that they may regard them almost as routine unless the importance of each job is continuously emphasized to them. This seemingly casual approach of the old timer may very well disturb a customer who, for example, calls in to say that an automobile has struck the meter at her house and that gas is blowing from the leak. We continue to stress to all our people that such a situation should be handled not only soundly from our point of view, but also so that the customer will realize that we consider it an important assignment.

7. Do the reports and records used facilitate the administration of the program? One of the major stumbling blocks to the formulation of a sound maintenance program is the common lack of adequate information. Typically, inventories of pipe by age are difficult to make, soil corrosivity conditions can only be determined approximately, pipe coating records are fragmentary, and no positive basis exists for determining actual pipe mortality curves from pipe retirement data. The headaches resulting from such inadequate data should be remembered in determining what records and reports are needed for the continuing operation of the program. They should be suitable not only for day-to-day administration, but should also provide information necessary for sound, basic reappraisals of the program which should be made from time to time, and for improving the accuracy of assumptions regarding remaining pipe life on which its economic evaluations are based. In order to amass data necessary for both current administration and long range evaluation and to supplement information gained from barring surveys, we ask both company and contractor field crews to report the condition of any of our underground pipe whenever they expose it for any reason. A standard

report form and nomenclature have been developed to simplify complete and consistent reporting of pipe coating condition, extent and degree of rust formation, extent and depth of pitting, location of pitting, etc. This data, plus any leakage information, is then posted to pipe condition records. In this regard, the problem of training field personnel in the proper techniques of adequate record keeping is a continuing one and should not be under-emphasized.

Thinking for the moment of day-to-day operations, we have found it very advantageous to use atlas sheet maps of the system as our basic record on which to post all information relating to pipe condition; leakage data, soil corrosivity readings, leak repairs, pipe inspection report data, etc. Standard symbols are used to post this information so that all data regarding the condition, past leakage history, and corrosion conditions can be seen at a glance for any portion of the system. This procedure, we believe, is superior to card file records which do not lend themselves to a comprehensive review.

8. *Do the employees administering the maintenance program have a complete understanding of its objectives and the basic concepts on which it is based?* The success of a system maintenance program depends on the skill and understanding of everyone involved in its administration—the field crews making condition surveys, the clerks posting condition data, the engineers initiating surveys and evaluating maintenance alternatives, and the supervisors approving work orders. These activities are so highly interrelated that a misconception or misunderstanding in one group can appreciably reduce the program's effectiveness.

Our particular plan of organization makes it very important that everyone involved have a general understanding of the program's operation, since there is no single point of detailed review for each work order initiated as a result of the program. As a consequence, we have prepared a statement outlining the basic objectives and concepts on which our program is based, to guide the division managers, division distribution superintendents, and division engineers in their administration of the local programs. A similar statement has been prepared for the guidance of field crews, emphasizing in particular the necessity for their reporting any condition they encounter in executing a maintenance order which might influence the decision on which the order is based. For example, on a leak repair order they may find much more extensive leakage than the original survey indicated, and as a consequence replacement may actually be more economical than completing the repair order.

The cost analysis curves *(Figs. 1 and 2)* are also designed to ensure complete and consistent evaluation of the economics of repair vs. replacement throughout the company. These curves have been calculated to include the extreme cost and corrosion conditions actually encountered in the various divisions.

9. *Are there new maintenance techniques or procedures which should be considered?* The ultimate goal of any distribution maintenance program is to assure the continued serviceable life of the system, at the lowest possible total cost. Achieving this goal necessitates a periodic review of new developments in maintenance procedures or techniques which might do the same or better job at a lower cost.

A factor to bear in mind in this regard is that if the maintenance program is successful, the maintenance needs of the system are continuously changing and as a result the most appropriate maintenance procedures may also change. For example, our present maintenance program is concerned almost exclusively with bare and poorly protected pipe. In the earlier years of the

Fig. 3. Instructions for modified survey.

Standard Methods
Effective: 1-1-54
Cancels: OB 1551.1-B (Temp)

Southern California Gas Company
Distribution Training
Job Breakdown Sheet

Operation: Survey for Leakage Using Modified Barring Procedure

Equipment Used: Approved Gas Leak Indicator with Copper Tubing Probe Extension, Prospect Bar Equipped with Tapered Point and Crossbar, Hammer for Driving Prospect Bar, Modified Barring Order (See Sample in Index 17, Records Manual).

Important Steps	*Key Points*
At Base	
1. Check condition of equipment and materials to be used.	1. (a) Check condition of batteries and filter in gas leak indicator.
In Field	
1. Verify location of job.	1. (a) Check with barring order. (b) Check with map book.
2. Determine starting position.	2. Check with barring order.
3. Sample street openings.	3. (a) Test *every* street opening, water meter box and valve stand for the presence of gas. (b) Test cracks in paving for presence of gas. (c) Observe vegetation in parkways and on private property. Make prospect holes and take samples if leakage is indicated. (d) Take a sample directly behind curb or paving and approximately over the service pipe, make prospect hole if no valve box is available for sampling. (e) Note the maximum sampling interval of 25 ft. indicated on Modified Barring Order. If no sample can be obtained by means listed above within an approximate distance along the main equal to the sampling interval indicated on the Order, prospect holes will have to be made. (f) Prospect barholes should be 12 to 15 inches in depth.
4. Record leakage found.	4. (a) Do not make negative entries (no leakage found, 0%) when there is no indication of gas. (b) Telephone Dispatch office if hazardous leak is found, or, issue appropriate order for repair. (c) Note action taken in "Remarks" column.

MODIFIED BARRING ORDER

When Form is Used

The Modified Barring Order is used to conduct limited leakage investigations not requiring the normal barring procedure.

All items on the form are self-explanatory so detailed instructions have been omitted; however, the procedure for conducting a Modified Survey is outlined in a Job Breakdown in the Distribution Department Field Manual #1, Section X, Index 1551.1-B.

MODIFIED BARRING ORDER

Use Modified Barring to survey for leakage approximately .....feet

of (Bare or Poorly Protected) (Wrapped .....) main on .....between .....and .....

Record Data only where leakage is found.

Survey N E S W side of street, *only* ☐ Maximum Sampling Interval: 25 feet

Survey *both* sides of street ☐ Order issued by: ..... Date.....

Reason for Order .....

Type of Leak (Use Code)	*% Gas*	*Location*					*Remarks*
		House No.	*Side of Street*	*Approx. Distance*	*Direction*	*Cross St. PL or LL*	*Give Distance from curb or PL, if on priv. prop.*
					/0		
					/0		
					/0		
					/0		
					/0		
					/0		
					/0		
					/0		
					/0		
					/0		

Type of Leak Code—SO: Street Opening. WMB: Water Meter Box. CV: Curb Valve. BH: Barhole. BHOS: Barhole Over Service. PC: Pavement Cracks.

No. Men on Crew ..... Account No. .....Date Completed .....

Time Arrived ..... Departed ..... Crew Leader .....

REMARKS .....

.....

.....

Note: 1.) Do not make negative entries (no leakage found, 0%, etc.) when there is no indication of gas.

2.) If area is not practical for modified barring, return for reassignment to regular barring crew.

program, the pipe being considered for maintenance had generally reached a stage where repair or replacement seemed the most practical and economical alternatives. Neither reconditioning nor cathodic protection were suitable for the maintenance problems presented by this pipe.

As our older main has been replaced on a "worst first" basis, the general condition of the pipe remaining has improved. For at least some of this pipe, reconditioning may prove to be a more practical and economical solution, particularly in view of recent improvements in pipe cleaning and coating techniques. Cathodic protection is also being investigated thoroughly as a possible solution to the pending problem of maintaining our older coated mains and for new installations in corrosive soil areas. We currently have some two million feet of distribution main and service under cathodic protection on an experimental basis as a means of evaluating this maintenance alternative under our operating conditions.

10. *Is the distribution maintenance program abreast of current financial conditions?* As indicated earlier, the very operation of a successful distribution maintenance program generates the necessity for a periodic appraisal of the program in the light of current conditions. Until that happy time comes when equilibrium is reached, and system deterioration is exactly matched by system maintenance, the basic job for which the program is designed is progressively changing. We've already discussed the implications of this in relation to the necessity for searching out new maintenance techniques which might be more appropriate for the current maintenance problem.

I have also indicated earlier that distribution maintenance is not simply a technical matter, but an economic one as well. The economics of system maintenance must also be reviewed from time to time—actually probably more frequently than the technical aspects. Interest rates, taxes, the company's earnings picture and rate structure, the regulatory climate—all have a very direct bearing on the final cost of a maintenance program and changes in any of these may very well necessitate changes in that program.

We recently retained a firm of consulting accountants and economists to review our maintenance operations with these financial aspects to be a basic part of their study.

Are give-away industrial rates downgrading gas-burning equipment?

IS industrial gas being sold so cheaply that the customer has lost the incentive to install good, efficient gas burning equipment?

J. G. Hopping, an industrial gas engineer from Piedmont Natural Gas Co., Charlotte, N. C., thinks this situation exists to the detriment of the gas industry in many sections of the country. He expressed this conviction before the recent Southern Gas Association annual meeting in Houston.

"The lower the rate, the longer it takes to justify the purchase of good equipment," he declared. "When industrial gas rates drop to the fantastic low that are in existence in some locations, any consideration of fuel efficiency as related to gas is eliminated. In other words, if the annual fuel consumption of the customer is 100,000 Mcf at 20 cents per thousand, the gas cost will be $20,000, and if by the purchase of good equipment he could realize a saving of 6 cents on fuel cost, the saving would be $1200. But if the gas rate was 55 cents per thousand for the same volume, the annual fuel cost would be $55,000 and 6% of $55,000 is $3300. A savings of $3300 per year will justify the difference in cost of good equipment over poor."

If the rates are so low that an equipment supplier can misjudge operating cost estimates by as much as 10% and still undersell competitive fuels, the value of gas is not being recognized and "you are passing up dollars that rightfully belong to your company—and you have not improved your position in the fuel market by permitting this haphazard type of job," he said. "Even though the customer is paying for wasted fuel, with good equipment and a fair rate your company would increase its profits by reducing the volume required for each customer, he would pay more for the gas actually used, and you would gain more customers."

In many cases, he said, production techniques appear to dictate the quality of the equipment selected rather than fuel economics. If precision heat control is not required in a process, poor equipment is being tolerated.

But when a fair rate is being obtained for the gas and the economics are competitive with other fuels, the customer will be more cautious in his purchase of equipment and will seek the gas company's advice; the unqualified sales representative with inferior equipment will find he cannot compete, and the utility will become an important influence in the selection of equipment, Mr. Hopping pointed out.

It's good public relations, too, he said; and the customer engineering department will be proud of the installations and will be eager to "defend" its choice of fuel and equipment.

Mr. Hopping reported on results of scientifically conducted field tests to show comparative rates that could be charged, with efficient gas-burning equipment:

"(a) Underfeed type stoker. Efficiency 42% to 60%, depending on operation. This type equipment is usually associated with a relatively small fuel user. When the price of coal in the volume normally associated with this size application is from $9 to $12, gas can be sold for 55 cents or 60 cents per thousand cubic feet, depending on the volume of gas used, on an interruptible basis.

"(b) The 'Pea-Shooter' or spreader type stoker. Efficiency 50% to 72%. This type of equipment normally has greater capacity and higher fuel volume requirements. Gas can be sold for 45 cents to 50 cents in this volume.

"(c) When pulverized coal, selling for $8 to $8.50 per ton is used and efficiency is 83%, gas can be sold for 32 cents per thousand. In analyzing oil, natural gas should be based on a 10% improved efficiency factor."

There will be reaction against higher rates, Mr. Hopping admitted. "But we must evaluate the intangibles and the cost of operating the stoker, and fuel handling equipment and its maintenance. One fuel company, as an example, submitted a report indicating that coal (at the rates shown above) was far cheaper than natural gas. But the report failed to mention an 18-hp electric motor load on the 400-hp boiler or any consideration of labor requirements. This and the intangible factors changed the economics entirely.

"Gas is a premium fuel and its intangible benefits and savings are many. In areas where natural gas has been the accepted fuel for a long time, customers are beginning to recognize these good qualities. The cost of natural gas is rising, and we can no longer take the price for granted.

"In the past year we converted 51 boilers from coal or oil with no high bill complaints. We participated in the selection of equipment, and it was good."

GAS exclusive

At Peoples Gas, tomorrow's executives will be safety engineers

One-year "borrowing" program teaches safety consciousness to promising young engineers

Descending rate of lost time accidents shown on chart impresses safety trainee during his first day in the safety department.

ONCE a year the safety department of The Peoples Gas Light & Coke Co., Chicago, voluntarily sends a well-trained safety man back to operating duties as an engineer. At the same time another engineer is transferred from his regular duties to a year of training and work in the safety department.

Ernest S. Beaumont, safety director at Peoples Gas since 1919, explains the novel program this way:

"Operating personnel sometimes feel that safety is the responsibility of the safety department. But we know that safety is *a part of* operations, not *apart from* operations. If, over a course of years, we can have in a number of important positions in our company men who have real safety consciousness, the effect will show in our safety record. Our accidents will be less frequent and less severe."

It will take a good many years, Mr. Beaumont points out, for the effects of this program to show in the safety statistics of the company. The program was started at Peoples Gas in 1948, and it will be some time before even a fair percentage of the company's younger engineers have spent a year in the safety department.

"We know that these men, as executives, will do the most for accident prevention," Mr. Beaumont says. "We usually take an engineer who has been with the company for two or three years. After a year in the safety department, he may be assigned to distribution, to a production station, or to service work. Wherever he goes, he will make accident prevention a part of operations."

Actually the engineer "borrowing" plan is but one part of the company's overall accident prevention program, and only the results of the entire program can be measured with any accuracy. Since 1919, when Mr. Beaumont became the first full-time man assigned to safety at Peoples Gas, the rate of lost-time accidents has shown a fairly steady decline. In 1953 the company achieved its lowest lost-time-accident rate ever, with an incidence only 15% of what it had been in 1919.

The Peoples Gas accident rate for 1953 was 6.5 lost-time injuries* per million man hours. While the average rate for all industry is 9.6, the average for gas utilities is about 14, which makes the Peoples Gas figure of 6.5 look very good. Since the company numbers 4700 employees, its figures come from a large enough group to be considered valid.

The selection of a new man for safety work each year is no particular problem, Mr. Beaumont says. Through personal knowledge of the younger engineers, Mr. Beaumont and Frank P. Mueller, assistant safety director, make tentative selections. After discussion with the chief operating engineer, one man is chosen. He goes to work in the safety department in the beginning of January.

"From the very start, the man is a safety worker, not a trainee," Mr. Beaumont says. After a brief introduction to the safety department's aims and procedures, the new man starts work, at first under the supervision of Mr. Mueller or Mr. Beaumont, and then on his own.

"In general, we group the safety department's jobs into three categories—keeping statistics, investigating accidents, and promoting prevention," Mr. Beaumont says. "The young engineer has a hand in all of them, and soon

*Injury that prevents employee from returning on next shift.

learns to do almost every job in the safety department."

Part of the Peoples Gas safety promotion program, for example, is a continuing series of monthly departmental safety meetings. The meetings are held separately by each of the approximately 25 operating departments. While these meetings are ordinarily conducted by the department executives, they very often delegate this job to the safety department. The new man attends a number of these meetings and watches Mr. Mueller or Mr. Beaumont give a safety presentation. Subsequently, when he has a sufficient background in safety work, the new man starts handling many of these meetings himself.

Ernest S. Beaumont, safety director, shows current trainee, John Ullrich, and assistant director, Frank P. Mueller, the monthly statistical report that goes to all operating departments. Executives of departments follow these reports closely, attempt to improve safety records.

Mr. Mueller conducts Trainee Ullrich through display in safety department office, shows him a safety shoe that saved a Peoples Gas employee from complete loss of front of foot.

The trainee also handles much of the safety department's statistical work. Each month a very complete report is drawn up, showing the accident rate, breaking the figures down by departments, and comparing these figures with the same period of the previous year. Copies of this report are sent to all department executives and are read with interest. This close reporting helps keep operating department heads safety conscious.

The trainee also helps with investigation and inspection duties. When an accident occurs, the safety department gets a telephoned report if the injury involves medical treatment and later a written report. The safety department checks on the condition of the injured man, cooperates with the claim and medical departments, makes a brief investigation of the accident, and sits in with the committee that makes the report. The trainee learns all the procedures and later handles some of these investigating duties.

Inspection of safety conditions in shops and of equipment is another safety department job the trainee learns to handle. These inspections are made periodically by one safety man and one operating man going through the department together. Often the engineer's technical knowledge is of great value in these inspections.

The trainee also takes an active part in the company's many other safety jobs. Peoples Gas promotes safety aggressively through posters, motion pictures, employee forums, house organ publicity, prizes for departments with good safety records, Porto-Clinic testing for drivers, sending engineers to safety conferences and safety schools, and many other methods. The trainee may arrange for a motion picture, attend a meeting, make an inspection and then write a list of topics for discussion at street gang safety sessions all in one morning.

"These safety-trained engineers are a valuable asset in selling employees on the benefits of our safety shoe and eye protection programs," Mr. Beaumont says. "They also assist in promoting employee attention to safety off the job where accidents cause more than twice as much lost time as work injuries. Another approach to this problem is the safety department display of protective devices appropriate to home as well as shop. Employees have requested for personal use over 2000 first aid kits, 150 fire extinguishers, 175 flasher lanterns and sundry ladder feet, masks, shatterproof glasses and other safety materials.

"In addition to the long-range effect of this program on safety, having a new man working with us each year has some immediate benefits for the company, the safety department and the man himself.

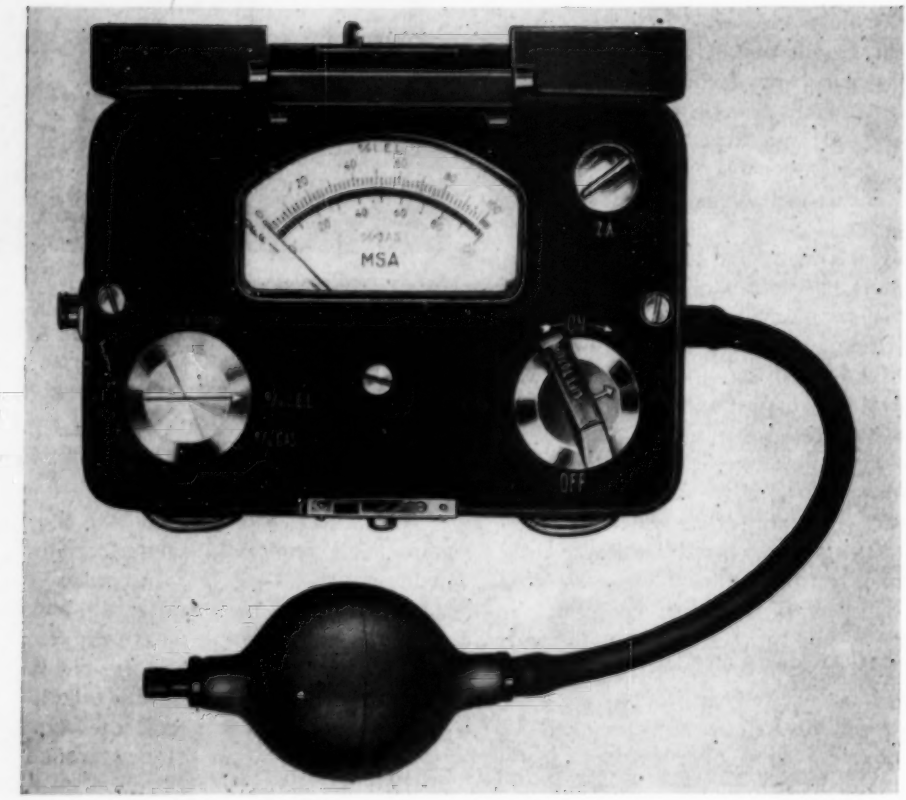
"In its technical emphasis, the education of an engineer often neglects important aspects of a man's work—knowing how to address a group, how to meet and handle people. In his year of safety work, the engineer gets plenty of practice in speaking and this eventually benefits both him and the company. In safety work, he gets around quite a bit and gets to know a great many of the company's employees in the course of a year, and that also helps him and the company later.

"The safety department benefits, too. We get the services of an interested and competent young man, enabling the department to expand its promotion of accident prevention. Also, we get the fresh viewpoints of someone who has not been too closely associated with safety work, and sometimes even learn interesting things about the attitude of employees toward the safety department.

"The training of safety engineers and the stimulation of general employee interest brought the Peoples Gas injury record to an all time low in '53 and we expect the favorable trend to continue."

Safety trainee may have to do all sorts of jobs. Here he acts the "victim" as Mr. Mueller demonstrates the new method of resuscitation to office staff. Any gas company employee, it is pointed out, might be called upon to revive someone.

Trainee first attends a number of departmental safety meetings, then starts handling some himself. Here John Ullrich watches Mr. Mueller demonstrate a Chemox gas mask at a joint meeting of the gas dispatch department and 22nd street station.



The Gascope has a single range switch or selector for its dual function. The on-off switch also operates a rheostat to adjust zero of both gas detecting and measuring scales. A separate zero adjustment (Z.A.) compensates for differences in resistance of two detector filaments after extended periods of use.

Detection and measurement of trace concentrations of combustible gas in bar holes are greatly simplified with this new combination instrument. The Gascope's electrical range multiplying system utilizes both the combustion principle and thermal conductivity method without dilution technique.

A new approach to gas leak detection

By N. W. HARTZ · Instrument Line Manager
Mine Safety Appliances Co., Pittsburgh

THE search for a more accurate, simple, full-scale combustible gas indicator has recently culminated in the development of such an instrument. The experiences and techniques of the past were used to advantage in the design of the new device. In order to understand how the new indicator came into being, it will be helpful to trace the development of such instruments over the past 25 years.

Approximately 25 years ago the first combustible gas indicators were introduced into the gas industry to replace flares over bar holes and flame tests on trapped bottle samples. These instruments were a tremendous improvement over the "fire tests" and earlier efforts to detect leaks by odor. Specifically they eliminated much of the guess work in checking for the presence of gas. With them it was possible to detect much lower concentrations of gas than was formerly possible. This enabled users to detect leaks that previously had gone undetected. By showing the presence of minute concentrations of gas, a search could be instituted for the exact source from which it was escaping.

Soon after the adoption of these instruments by the gas utility companies, their value was widely recognized. Many thousands were put to use for testing manholes for hazardous concentrations of manufactured and natural gas; for regular surveys of all street openings to detect the presence of distribution system leaks; for investigating leak complaints on consumer properties; and in regular maintenance inspections in utility properties such as compressor and regulator stations, gas holders, by-products plants, and other locations.

Early in the application of these instruments, some enterprising utility men recognized that while the combustible gas indicators were useful in detecting leaks, the confinement in range to from zero to 100% of the lower explosive limit impeded their usefulness in tracing leaking gas to its source. By the use of comparative tests in a series of manholes along a street, the relative readings obtained at each by means of a combustible gas indicator did isolate the leak to a section of pipe between two adjacent manholes where the instrument readings were highest, but this still left several joints as potential places from which gas might be escaping. It was recognized that if the range of the instrument could be extended it might be possible, by driving a series of bar holes over or near these joints, to fix the source of leakage positively. This would avoid the necessity of making a number of expensive pavement cuts and excavations.

GAS exclusive

This line of thought, coupled with a knowledge of gas burners, led the utility men to attempt development of a quantitative method of diluting samples too rich in gas for their indicators, to a point where readings would be "on-scale" and comparative. A variety of "diluters" emerged from these efforts. Eventually instrument manufacturers were making dilution tubes, dilution valves, or range multipliers, as they were sometimes called. These devices enabled field crews to pinpoint leaks in buried pipelines before any of the pipe was exposed by excavation.

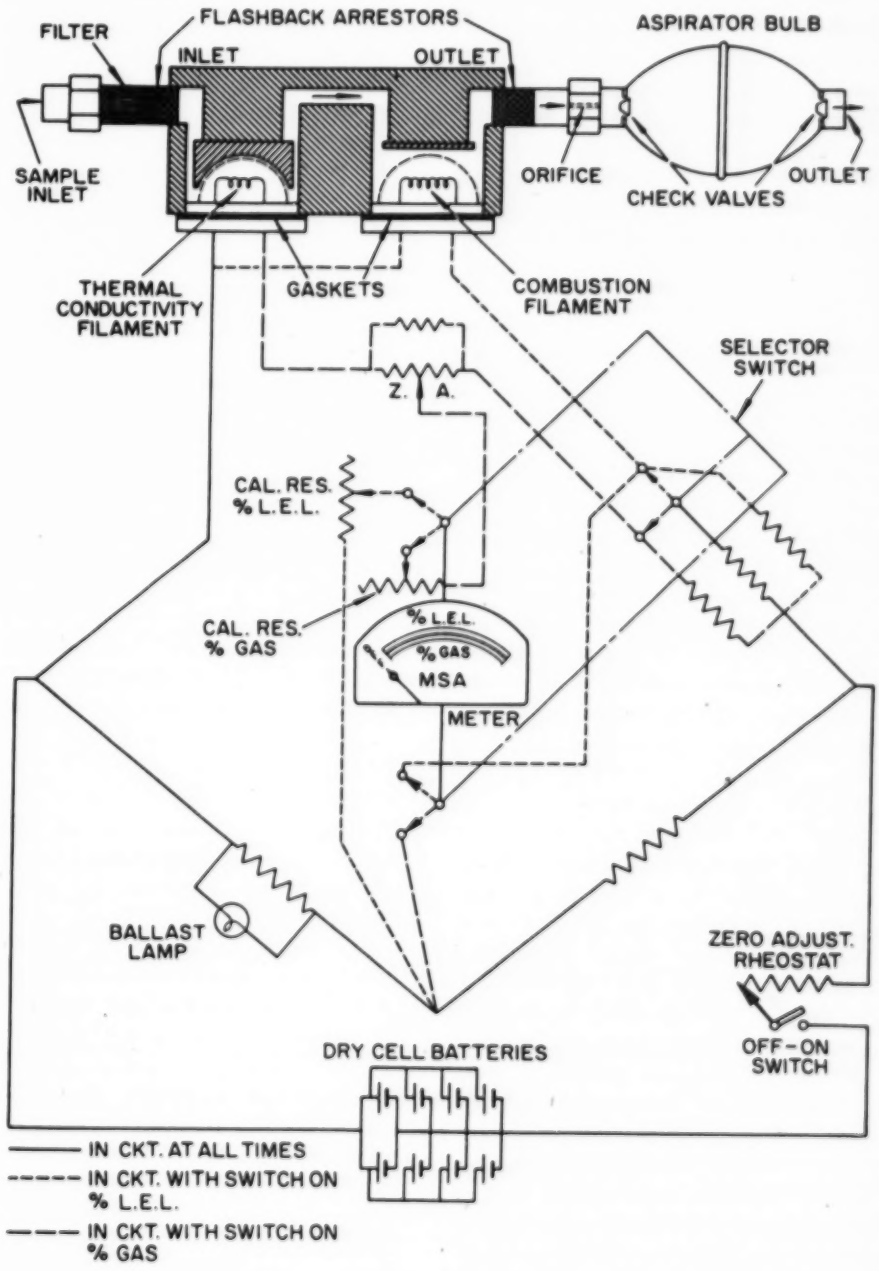
In general, these combinations of a combustible gas indicator and a dilution accessory have done an effective job, as evidenced by their use throughout the entire gas industry as a standard method of leak location.

The limitations of this system can be readily understood when it is realized that the total flow of sample through these indicators is only one or two-hundredths of a cubic foot per minute. Assuming a lower explosive limit for natural gas of approximately 5% by volume, and for manufactured gas only slightly more, to make the combination useful in comparing mixtures up to and including 100% gas required dilution of the sample with air on the order of one part of sample to 20 parts of a gas-air mixture. This meant controlling gas sample flows on the order of 0.0005 to 0.0010 cu ft per minute through a fixed orifice with a pulsating suction from conventional rubber aspirator bulbs. While the widespread acceptance of the method testified to the fact that the combination worked most of the time, the various factors all combined to make the test operation a highly involved task.

Another approach to the problem of locating leaks in buried pipes is the "pressure method" or "free flow method." For this method, a combustible gas indicator is stripped of its aspirator bulb and flow restricting orifice, and is equipped with sampling line and probe. The probe, surrounded by a plug, is inserted into a bar hole in such a way as to seal the hole. Gas pressure then develops in the bar hole and causes gas to flow through the probe and sampling line to the indicator. By measuring at each of several holes the time lapse from the insertion of the probe until some finite deflection of the meter pointer, one can tell where the pressure is highest by determining where the time increment is lowest.

Since there should be a decrease in gas pressure from the point of gas leakage to its eventual escape from the ground, the bar hole that shows the fastest response should be nearest the pipe leak. This method has never been generally accepted because it is slower than the dilution technique. However, it is uniquely adapted to testing where a large area of ground under a solid pavement is saturated with leaking gas and where a dilution system might give equivalent readings at each of several bar holes.

Over the years, repeated efforts have been made to improve these techniques. One that has been applied to a limited extent utilizes a combustible gas indicator with electric circuit modified so that the polarity of the indicating meter can be reversed at will by the operator. The thinking behind this modification was that trace concentrations of gas could be detected and measured with one instrument. After a gas leak is traced to its source, the polarity of the meter is reversed and gas concentration is determined by its conductivity. Because natural or manufactured gas, when present in high concentration, conducts heat away from the detector filament at a more rapid rate



Gas samples pass over separately activated thermal conductivity and combustion filaments in series. Bridge circuits for each filament are served by the same batteries and indicating meter, and have a common compensator side. A single selector switch makes all changes in connections between the two circuits.

than air, this effect can be used as an index of concentration.

However, because the filament's capacity to burn gas is limited by the oxygen available for combustion, an indicator so adjusted has a peculiar calibration curve, which may show the same reading for two widely different concentrations of gas. To overcome this, an intermediate range was established between the scale on which the percentage of the lower explosive limit can be read and that on which rich concentrations may be compared. This middle range is achieved by means of a dilution technique wherein the maximum ratio is reduced to approximately ten to one.

Such a three-scale instrument is difficult for the average man to use because, in addition to the usual on-off switch, zero adjusting rheostat, and voltage-adjusting rheostat of the combustible gas indicator, there is an on-off valve for dilution and an electrical range switch, and the user must coordinate readings on one of three scale presentations by the manipulation of the controls.

The newly developed instrument is, in effect, two distinct instruments built into one case. As in the first instrument mentioned, this instrument utilizes the combustion principle for detecting gas concentrations that are less than the lower explosive limit, and the thermal conductivity method is for measuring higher concentrations.

By the use of separate sensing elements for the two methods, a distorted calibration curve for the thermal conductivity scale is avoided. Thus the calibration of the instrument for both scales was made substantially linear. For this reason, the intermediate scale of the older type instrument is not required and the need for dilution is avoided. This means then that the long-sought objective, an electrical range multiplying system, has been achieved.

If conventional design techniques had been used for this instrument, it would have been necessary to abandon the advances made over the past 25 years in reducing the weight of these instruments to approximately one-fourth of the original models.

It is obvious that by the proper selection of bridge elements, the battery complement used for one circuit could be used for the other. The diversion of power from one measuring circuit to the other then is one function of the "range" switch.

In any such instrument, users have regularly requested that the meter presentation be such that precise reading could be obtained: thus the need for a long-scale meter. Since such a meter represents the largest single part of any portable combustible gas indicator, it appeared that the only way to retain a lightweight, small size package for the dual type instrument was to use the same meter alternately across both bridge circuits. To accomplish this meant then a second function for the "range" switch.

Common compensator side

To make it possible to switch from one bridge to the other without intermediate delay or adjustment, the combination instrument has been designed so that the compensator side of the two bridges is common, and a small current, sufficient to heat the combustion element to a temperature just below the point at which it becomes an active catalyst, is allowed to flow through it, when thermal conductivity measurements are being made. This then establishes a third function for the "range" switch.

There are no valves to be coordinated with switch operation. Both detector filaments are so located in the flow system that the sample passes over them in series. Thus, to change from one range to the other, the operation of a single switch serving the several functions previously cited is all that is required.

Through the use of a common compensator side of the bridge circuit it is possible to use the same zero adjusting rheostat for both circuits. But, since combustion filaments increase in resistance with use, while thermal conductivity filaments do not, a second rheostat was added to compensate for the relative change. However, the rate of change of the detector is small, so that the latter rheostat need be operated only once in approximately eight hours of usage, to establish and hold zero coincidence for both scales. It is thus possible to switch in normal operation from one scale to another without readjusting the zero setting, and to move rapidly along a line of bar holes, comparing concentrations without having to stop and readjust the instrument.

As a consequence of its desirability as demonstrated through years of experience, a large capacity cotton filter for dust and water has been included in the inlet to this instrument flow system. Also as a consequence of past experience this may be replaced by a charcoal cartridge, or an external charcoal scrubber may be added to the instrument. The latter feature makes it easy to differentiate between natural gas and gasoline vapors, where a suspicious positive indication of combustibles is obtained at a manhole or sewer.

A number of other features in the design of this new instrument resulted from practical field experience or suggestions by prospective users. These include a lid to protect the meter and panel of the instrument when it is stored in a tool box or truck, but which folds back flat against the back of the case so as not to obstruct the user's field of vision when he is traveling over rough terrain or walking in the vicinity of curbs and curb boxes. In addition, the lid cannot be closed until the battery is turned off.

Also, there is included in the instrument an integrally mounted spare filament for both circuits. Thus, if a combustion filament should burn out, or if water should be drawn into the instrument and foul both the combustion and thermal conductivity filaments, a spare for each is immediately available for replacement.

The instrument is powered by flashlight dry cells because they are universally available. These are inserted through the bottom of the instrument so that there is no chance of disturbing the circuit components of the instrument when replacing the batteries. One set has sufficient capacity for eight hours continuous usage. As a further precaution, a solid partition has been cast as an integral part of the case so that if the batteries should decay to the point of leakage, the fluid from the cells cannot contaminate the vital parts of the instrument.

The entire instrument is housed in a die cast aluminum case for maximum strength and minimum weight. For easy, comfortable carrying a combination neck and waist strap assembly is provided.

This new instrument, known as the M-S-A Gascope, is a product of the John T. Ryan Memorial Laboratory of the Mine Safety Appliances Co. and represents the results of several years of intensive investigation. It has undergone extensive field trials, which have proved its utility and confirmed the intent of its designers—to produce a more useful, more trouble free, easier-to-use gas leak locater.

A general approach to burner design based upon results of AGA burner research

By **E. J. WEBER** • AGA Laboratories, Cleveland

At the PCGA-AGA domestic gas research and utilization conference in Los Angeles March 23-24, there appeared to be considerable agreement that findings in domestic gas research projects were not being incorporated into today's appliances as promptly and completely as they should.

Mr. Weber, in his talk before that meeting (which is published here), endeavored to interpret the various project bulletins as a whole and, by relating each to the others, suggest a general approach to burner design.

Mr. Weber is senior research engineer at the AGA Labs, where, since 1937, he has been largely responsible for conducting fuel gas utilization research. To date, this work has culminated in the publi-

cation of four research reports and 15 formal research bulletin, which he has authored or been active in their preparation. Mr. Weber has also assigned various patents to the association.

THE ultimate purpose of every gas burner is to convert the potential energy of gas into useful heat which is to be absorbed by the object being heated. To effectively achieve this purpose, the design of the burner must be properly matched with the design of its appliance.

As far as the burner alone is concerned, it must provide the following characteristics:

1. Uniform distribution of heat over the area being heated.
2. Flame stability in that the flames neither lift from nor flash back through the ports.
3. Completeness of combustion in that neither carbon monoxide nor carbon escape from the flames.
4. Ease of ignition as a result of rapid flame travel from port to port over the entire burner.
5. Satisfactory controllability over a wide range of turndown.
6. Quiet operation at all times including ignition and extinction.
7. A certain degree of flexibility that permits the burner to be easily adjusted so as to accommodate a reasonable variety of gas compositions and line pressures.
8. A certain degree of flexibility that provides satisfactory performance, without readjustment, on gases somewhat different from the one on which the burner is initially adjusted.

Practically all of these charteristics are primarily dependent on the burner's port design and port arrangement. The port area should, therefore, be the starting point in the solution of a burner problem.

It cannot be over-emphasized that a burner should match its appliance design. This matching may be accomplished by first selecting a value of primary aeration for the burner that meets the combustion requirements of the appliance.

As approximate values, range top burners may be considered as requiring 55 to 60% primary air; and oven burners and water heater burners, 35 to 45% primary air. Radiant type space heaters may require as high as 65%, while other types of heating appliances may require as low as 35% primary air.

Of course, individual conditions of head room, flame direction, secondary aeration and the like may alter these approximate values somewhat.

The next step would be to design the port area so that it is compatible with the selected value of primary aeration and the desired input rating of the appliance. This is probably the most difficult part of the entire problem. It requires a knowledge of the effects of such variables as port size, depth and spacing on the so-called flame limit curves. These limit curves merely define the combinations of primary aeration and input rate per square inch of port area with which flashback, yellow tipping and lifting flames are obtained.

A simple example of an effect of a variable on these limits would be that of an increase in port size, which permits an increase in either primary aeration or port loading without incurring lifting flames. The same increase in port size would also require an increase in the amount of primary air needed to eliminate yellow tipping, as well as increase liability toward flashbask.

Extensive data on effects of port variables on the limit curves are given in Bulletin 13, "Fundamentals of Design of Atmospheric Gas Burner Ports." However, a simpler presentation of this same type of data may be found in Research Report No. 1192, which is concerned with burner flexibility on base and peak load gases.

An important conclusion, reached in this latter work, was that the magnitude of the effect of any one variable on the flame limits is independent of the over-all burner design. For example, a change in port spacing from ¼ in. to ⅛ in. will raise the lifting limit by

Fundamentals of Design
of Atmospheric Gas Burner Ports

Study of Burner Flexibility
on
Base and Peak Load Gases

AMERICAN GAS ASSOCIATION LABORATORIES

Extensive data on effects of port variables on the limit curves are given in Bulletin 13 on "Fundamentals of Design of Atmospheric Gas Burners." A simpler presentation of this same type of data is found in Research Report 1192, which is concerned with burner flexibility on base and peak load.

a constant amount of 3.5% primary air regardless of the nature of the burner. Furthermore, this change in the limit curve, brought about by a change in a port design factor, is constant and independent of the type of gas being burned.

This conclusion permitted a simple organization of the data in Report No. 1192. The yellow tip and lifting limits of a particular burner operating on natural gas were arbitrarily chosen as reference limits. The effects of such variables as port size, depth, spacing and direction as well as number of rows of ports were then tabulated in terms of change in per cent primary air with respect to the reference limits.

Thus, the limit curves for a proposed burner design may be easily estimated with the aid of these tables. The effects of all the port design factors in the proposed design are added together and the total effect is applied to the reference curves.

Actually, there is no cookbook recipe that can be followed in designing port area. Usually, with some judgment, a reasonable port size and depth is first selected. A port loading, suitable to the gas to be burned, is next chosen and this in turn determines the total number of ports. These ports are then distributed over the space available for the port area.

However, the results of such a procedure should be considered only as the first trial design. Anticipated performance of this trial design can and should be checked with data such as in Report No. 1192. Flame limit curves may be constructed for the proposed design, and plotting the previously selected primary aeration versus port loading will locate the burner adjustment point on the diagram. Anticipated performance will thus be indicated by the relative position of this adjustment point with respect to the predicted flame limits. It may be necessary to manipulate the port variables to shift the flame limits so as to achieve the desired performance in a second or even a third trial design.

In judging anticipated performance, the question of burner flexibility must be considered. One type of flexibility permits a burner to be adjusted on different types of gases. An ideal universal burner would be an example of one having the greatest amount of this kind of flexibility.

Unfortunately, the actual universal burner does not achieve a high degree of this flexibility because its design must be compromised to take into account the opposing characteristics of different types of gases. Actually, a well designed natural gas burner will accommodate a variety of natural gases better than a universal burner.

A second type of flexibility permits a burner to accommodate a variety of gases without any change in adjustment. Both this and the first type of flexibility mentioned are dependent to a great extent on the nature of the flame limit curves. Stated in a few words, burner flexibility can be obtained by providing as great a span of adjustment as possible between the flame limits. For example, the primary aeration at which lifting flames occur should be considerably higher than the primary aeration at which yellow tipped flames occur.

The span of primary aeration between lifting and yellow tipping increases as the input rate per square inch of port area is decreased. Therefore, burner flexibility can be achieved by avoiding over-loading of the port area. This is particularly true if the selected primary aeration is high. However, smaller port sizes should be used with the lower port loadings to avoid flashback on ignition or extinction.

Unfortunately, some variables, such as port size and port spacing, which influence lifting flames, also affect yellow tipping in an opposite direction. In many cases, it would not be feasible to increase the span between yellow tipping and lifting by a change in port spacing. A decreased port spacing will increase the amount of primary air permissible without lifting flames but will also increase the amount of primary air required to eliminate yellow tipping.

Thus, with close port spacing, both lifting and yellow tip limits are high while, with large spacing, both limits are low. However, the span between the limits is about the same in both cases. With the same value of adjustment span, the high limits are preferred with a high selected value of primary aeration and the low limits with a low selected value of primary aeration.

Only at very close port spacing, on the order of 1/16 in. edge to edge, is the lifting limit affected considerably more than the yellow tip limit. Under this condition, the span between the limits would be greater than that with larger spacing.

There are other factors that can be manipulated to increase the span between the limits and hence increase the burners' flexibility. Increasing port depth raises the lifting limit without having any effect on the yellow tip limit.

A horizontal port burner, being more susceptible to lifting flames, will usually have a smaller adjustment span than a vertical port burner. However, a ledge, placed slightly below the horizontal port, will reduce lifting tendencies and thus increase the adjustment span of this port to equal that of a vertical port. In most instances, the ledge protects the flame from the wiping action of secondary air flow. A ledge placed very close to the port also serves to reduce the velocity of the flow stream issuing from the port. Ledges become ineffective with close port spac-

ing on the order of 1/16 in. or less. This close a spacing will have raised the lifting limit to a high value and a ledge can have no further effect on this limit.

Using more than one row of ports, with conventional row spacing, increases the yellow tipping tendencies of a burner without having any effect on lifting. Therefore, a burner having multiple rows of ports usually has a smaller adjustment span than a single row burner.

The amount of primary air required to eliminate yellow tips depends on the thickness of the over-all flame up to a certain limiting thickness. Thereafter, the primary aeration at the yellow tip limit remains constant with any further increase in flame thickness beyond the limiting value.

It might be expected that increasing the spacing between the rows of ports of a double-row burner would decrease the yellow tipping tendencies. In other words, increased row spacing would permit better access of secondary air between the flames in the two rows.

Actually, however, row spacing has to be at least ¾ in. for the above to be true. Secondary air flows at right angles to the flame from all sides of the burner and thus coalesces the flame into a single outer mantle. Therefore, if row spacing is increased from some low value up to about ½ in., the flame thickness is actually being increased to a value somewhat greater than the row spacing. Consequently, yellow tipping tendencies increase as row spacing is increased up to about ½ in. port edge to port edge.

Perhaps circular burners with vertical ports have the greatest yellow tipping problems. With close port groupings, these burners could have a flame thickness almost equal to the diameter of the burner. Consequently, this type of burner often has the maximum yellow tip limit. A maximum yellow tip limit of natural gas would require about 50% primary air to eliminate yellow tips. If the burner were not properly designed, this high an aeration might come very close to causing lifting flames.

As far as double row burners are concerned, I might suggest very close row spacing, on the order of 1/16 in. edge to edge. Little would be sacrificed with respect to yellow tipping with this close row spacing. On the other hand, it is with this spacing that the lifting limit is raised considerably. Hence, a wide span of adjustment between the limits is achieved with a double row burner. Use of staggered rows of ports facilitates close row spacing. It might also be mentioned that raised ports have no effect on yellow tipping and serve only to provide port depth.

With the port area design completed, the primary air injection system should be considered next. Sometimes I doubt that a general relationship will be derived that could predict the primary air injection for all possible burner designs. It is quite complicated to evaluate the effects of small details such as burner head design, bends in the mixer tube, surface conditions of the tube, and air shutter design.

Perhaps the mixer tube design can best be matched with that of the port area by following the old empirical rules. Throat area should be about one half the port area; distance of orifice to throat from one-and-one-half to two throat diameters; a venturi slope of 2 degrees; and a mixer tube length of at least six throat diameters.

Bulletin 37, "Primary Air Injection Characteristics of Atmospheric Gas Burners," may be used to estimate the primary air injection of a given burner design.

A theory of injection is presented in Bulletin 55, "Investigation of Primary Air Injection by Use of Variable Chamber Pressures."

However, Bulletin 37, "Primary Air Injection Characteristics of Atmospheric Gas Burners—Part 2," may be used to estimate the primary air injection of a given burner design. A proposed burner design should be checked to determine whether or not the selected primary aeration can be obtained. If, not, redesign would be indicated. In Bulletin 37, the effects of variables are evaluated into various factors which are applied to the usual momentum equation.

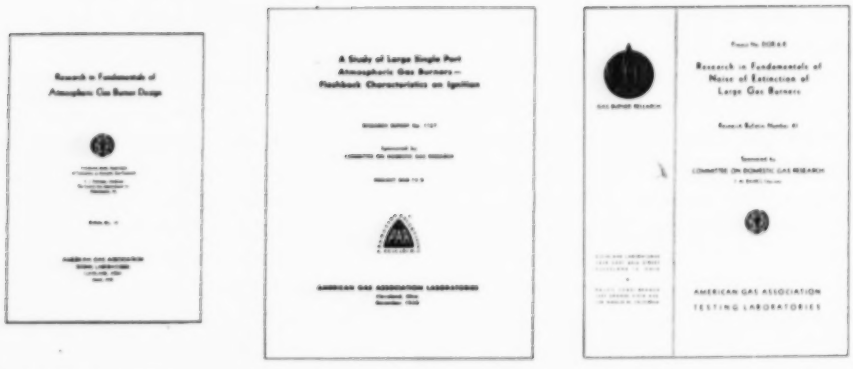
A theory of injection is presented in Bulletin 55, "Investigation of Primary Air Injection by Use of Variable Chamber Pressures." This theory, however, offers some practical lessons. The data in this bulletin support the idea that the momentum of flow in the burner equals the momentum of the gas jet at the orifice. This equality of momentum does not mean, however, that all burners have the same injection efficiency.

One burner, because of its design, may have a relatively high flow velocity down the axis of its mixer tube with a sharp fall-off of velocity near the walls. Another burner may have a relatively low velocity at the axis of the tube and a gradual fall-off of velocity near the walls. In other words, the first burner would have the sharper velocity profile of flow in the mixer tube.

With momentum being a product of mass times velocity, a large proportion of the momentum would be tied up in the high velocity component with a sharp profile. In comparison, a larger proportion of the momentum would be tied up in the mass component with a less sharp profile. Obviously, a greater volume of air would be injected with a larger proportion of the momentum resulting from the mass conponent. In both above cases, though, the momentum would be equal.

Primary air injection is therefore a function of the nature of the flow profile in the mixer tube. A poorly designed approach to the mixer tube throat will result in a sharp profile as will an oversized throat. Unsymmetrical openings in the air shutter, such as introducing air from one side only, will distort the profile and reduce air injection. A poorly designed transition from the mixer tube to the burner head will cause a rapid dissipation of the profile and thus will reduce injection.

In addition to the port area and mixer tube, there are other factors of burner design which will not be considered at this time. Such things as flame travel,



Flame travel; minimum turndown; flashback on ignition, extinction, or on rapid turndown; and burner head distribution are treated in Bulletin 10 and others.

minimum turndown, flashback on ignition, extinction, or on rapid turndown, and burner head distribution, are generally treated in Bulletin 10 and other bulletins.

As far as current burner research is concerned, a project is now under way to study the single-port burner in the same detail as the multiple-port burner was studied. The important variable with the single-port burner is apparently the size, shape and positioning of the flame target. This variable influences primary aeration and yellow tipping characteristics to a considerable extent.

Another current project is concerned with non-aerated blue flames. Particular attention will be given to the target type burner in which air is mixed with the gas in the turbulent zone between the gas orifice and the target. Noise of operations and limitations on turndown are the main problems with this burner.

Of course, we are still studying flame stability and the flame limit curves. In this study we are investigating means for raising the lifting limit without affecting the yellow tip limit. One such means is the use of flame retention. A small flame is located below and at the base of the main burner ports. Such a flame provides continuous piloting action and thus prevents flames from blowing off the ports. The effect on the yellow tip limit is negligible.

With this type of burner, natural gas port loadings as high as 90,000 Btu per sq in. of port area have been used. This is three to four times as much gas as is burned on the same port area of an ordinary natural gas burner. The natural gas lifting limit of this type of burner is practically equivalent to that of manufactured gas on an ordinary burner. Wide-open air shutter adjustments are feasible although it must be remembered that primary air injection is sacrificed with the use of high port loadings. The burner is quite flexible and has the further advantages of small physical dimensions and a high turndown ratio when high port loadings are used.

One other current burner research project is a study of secondary aeration. Recently published Research Report No. 1204, "Secondary Aeration of Atmospheric Gas Burner Flames" describes initial results of this project, as well as techniques and procedures. The present study employs a simple rectangular combustion chamber fired with bar burners. Windows were placed at both ends of the chamber so that flow could be observed with Schlieren pictures. These Schlieren pictures might be considered simply as shadow graphs caused by density gradients in the flow.

The principal observation made with the Schlieren apparatus was the existence of a dark horizontal band across the width of the chamber. This band indicated a zone of intermixing of flue gases with secondary air. When a decrease in secondary air, this zone moved downward toward the burner level. It was noted that combustion failed when the zone reached a certain level above the burner.

To explain these observations, the following concept was proposed: A vertical flame in open air entrains a definite amount of secondary air proportional to the height of the flame. For the most part, secondary air flows toward the flame at right angles to the flame.

This same flame may be placed in a combustion chamber with the flue restricted. Let the flue restriction be such that the air entering the chamber is only half the amount of air which the flame is capable of entraining. Under this condition, there is only enough air to flow toward the bottom half of the flame. However, the top half of the flame is still capable of entraining air. Since this air is not available, the top half of the flame will entrain flue gases. Thus, a recirculation of flue gases is established with an interface between the secondary air and the flue gases flowing toward the flame. The height of this interface above the burner level would equal the ratio of secondary air volume to the volume of air which the flame is capable of entraining times the flame height.

Because of diffusion, there is, of course, mixing of flue gases above and below the interface level. The CO_2 content of the atmosphere at the interface would be half the CO_2 content of the flue gases. Below the interface, the CO_2 would decrease to zero, while above the interface it would increase to the value of the flue gases.

In any event, there are flue gases surrounding the flame. As excess air is decreased, the interface will approach the burner level and the flue gas concentration at the base of the flame will increase until combustion fails.

In a number of experiments, baffle plates were placed in the combustion chamber at the interface level to prevent diffusion of flue gases into the secondary air. This expedient permitted an increase of 2 to 3% CO_2 in the flue gases without failing combustion.

Recently published Research Report 1204, "Secondary Aeration of Atmospheric Gas Burner Flames," describes initial results of a study of secondary aeration.

One conclusion which may be drawn from the above concept is that failing combustion can be corrected by an increase in input rate provided that the CO_2 in the flue gases (or per cent excess air) is maintained constant. Experiments have verified this conclusion.

At present, this project is continuing with a study of the effects of burner and combustion chamber design variables on the height of the interface level.

The gas inspector

"The gas inspector" is an unusual institution, to our knowledge. This article, published with permission of the "Gas Line," employee publication of the Union Gas Co. of Canada Ltd., Chatham, and its subsidiary, City Gas Co. of London, points out some of the hazards which these roving inspectors have found in their regular visits to customers' homes.

GAS inspector—friend of the consumer—fills a vital role in the company's service organization, checking and investigating installations of all types to insure that they are both safe and efficient.

Poor installations cost the consumer money, and sometimes may endanger health, and so, daily throughout the system, Union Gas inspectors call on consumers to keep a constant check on appliances.

Working out of Windsor, Chatham, London, and Sarnia, gas inspectors perform a vital service that perhaps is not too well known. Their task is to visit every home, and this they do in a regular system, all the while making other investigations for superintendents, sales departments, plumbers, dealers, and customers themselves.

Two of these inspectors are Nelson Romphf and Bill Shaw. Working together they are responsible for the Sarnia district, which includes most of Lambton county, which has approximately 10,600 gas consumers.

Nelson Romphf, who has been with the company since 1939, most of the time on customer service work, says that a gas inspector's duties are:

1. To carry out an inspection program dealing with safe and efficient utilization of gas.

2. To carry out specific, as well as routine, inspections of all meter and service installations.

3. To preserve good public relations with customers.

To carry these duties out an inspector must have a thorough knowledge of the utilization of gas and the safe and proper installation of lines, meters and gas-burning equipment. He also must know how to discuss tactfully with customers any unsafe or uneconomical use of gas or equipment on the customer's premises.

That's a big job, and inspectors are doing it every day. In fact, Nelson Romphf visits an average of more than 250 homes a month.

But the house to house canvass that he and Bill Shaw make is continually interrupted by other and more urgent investigations. The inspector is responsible solely to the district superintendent, and at his direction frequently goes out on calls to inspect new installations. The sales department, dealers, and others seek his services.

Frequently customers themselves will telephone the inspector and ask for a check on their chimney, or the location of a gas appliance they are installing. Sometimes it is a matter of clearance for appliances, such as: "If I put my range under these cupboards will it be all right?"

Inspectors are also called out to investigate fires. Every investigation into accidents caused by improper use of gas is made by the inspector.

All too frequently as the inspector goes about his house to house canvass he finds installations that are dangerous. Most of these are either side-arm water heaters—the copper-coil type burner that heats water and circulates it through on adjoining tank—or radiant gas fires.

Most of these unsafe installations are in old houses, and most of the trouble lies in improper venting.

Many cases have been found of side-arm water heaters in bathrooms without flues, or flues just jutting out through a wall.

"In such a case recently I asked whether the heater ever went out," said Nels. "They said, 'No, not if we leave the bathroom door open.' I had to explain the danger of fumes not going outside, and what would happen if it went out while someone was taking a bath. Here the flame was going out for lack of oxygen. The gas fumes wouldn't discharge, they backed up and smothered the flame."

Generally consumers are cooperative when the danger is pointed out to them. But the inspector doesn't let it rest there. He turns the unsafe appliance off, attaches a tag that declares it to be unsafe for use, and warns the consumer not to use it until it is repaired. Then he calls back in a few days to see if the installation has been repaired.

Sometimes he runs into conditions that are fire hazards, such as a 3-in. flue from a space heater running between

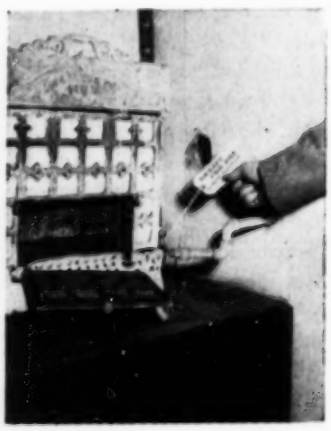
What the gas inspector may find

Bird's nest plugs poor vent.

Unvented water heater.

Unvented water heater.

Inadequate flues.



Unsafe and unvented heater.

Old range unvented.

joists into an attic, or a flue mounted tight to a wall without any insulating thimble. Sometimes he calls in the fire inspector to point out these conditions.

"I always try to approach these difficult problems in a nice way," he says, "but sometimes people are difficult."

He adds that he receives excellent cooperation from the fire, building and hydro inspectors when troublesome conditions are found.

Improperly installed water heaters can be found in bathrooms, and in vestibules, and even in clothes closets. Some are vented into and not through a wall. Sometimes people have ideas they think will work, such as steel wool stuck into the vent pipe. Once Nels found a tin can shoved over the end of a vent pipe. There were a couple of nail holes in the tin can, but they had rusted over and plugged off the draft tightly.

The inspector finds the same kind of venting troubles with space heaters—some without vents, vented through a wall, or otherwise improperly vented.

We've found space heaters in basements strapped to the ceiling, and cased in sheet metal below a grate for heating upstairs. One had absolutely no flue on it and the fumes were going up the grate into the house. We've even found them in bathrooms without vents," he said.

The only proper vent is a well-built chimney that is higher than the roof of the house, Nels points out.

"We've found people who buy burners and stick them into their furnace themselves, without any thought as to proper conditions.

"People just don't seem to have any respect for life when it comes to paying $50 or so to build a chimney."

Dampers in vent pipes are troublesome things. One case Mr. Romphf investigated, in which a young girl was temporarily overcome with fumes, was caused by a damper. It had become sooted over, and shut off all draft to the chimney.

"Never close a damper," he warns. "In most cases dampers are NOT required at all and should be removed. But if you do have a damper make sure that it is open."

In one section of the Sarnia district Nels found 65 unvented appliances. This called for a lot of re-checking, but he is glad to report that every one of them was repaired.

These are the worst cases. In most cases the installation itself is good, but

people are sometimes forgetful, which is why the constant check is so important.

In one case vent pipes on an old-type range were taken down so the kitchen walls could be painted. The customer didn't like the looks of the stove pipes, so he just decided to leave them down, until Nels caught up with him. In other cases vent pipes will be taken off basement water heaters while the customer fixes the furnace or something else, and then forgets to put them back.

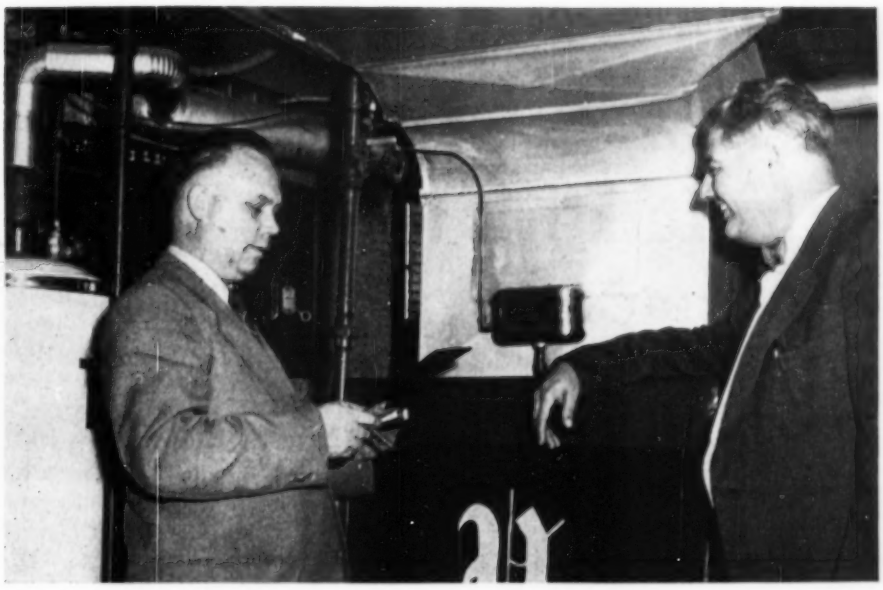
Just on a spot check here are five homes, selected at random, visited recently by Nels Romphf. One had an unvented water heater in the basement, and an unvented radiant fire in a workshop. Both were in use while the owner made some repairs. In the second home two space heaters were correctly installed, but in the cellar was an unvented side-arm water heater.

Installations in a third house were all perfect. In the fourth a new gas-designed furnace had been installed. In checking the installation Nels found two small leaks. But he also found that the meter in the house was too small to handle the load required by a furnace, and the piping from the meter to the furnace was also too small.

In addition, the meter was not level and was not strapped tight enough to prevent its sagging on one side.

In the fifth house Nels found a meter that was too small in capacity to serve a range, a water heater and two space heaters.

As in all cases the unsafe appliances in these homes were turned off and tagged unsafe for use, pending a call-back to insure their proper repair.



The owner of a model furnace installation, which is being inspected, is so proud of it that he has his initial painted on the front of the furnace.

That's the kind of job the inspector does every day—checking installations, finding errors of which the consumer is sometimes ignorant, and helping to adjust them. In the case of meter changes, or appliance adjustments, the inspector writes out the necessary orders and turns them into his superintendent every day.

Customer file

His daily work is carried out systematically. In his office is a file containing a card on every gas consumer. The cards are made out by street numbers and filed that way. As he enters each house he writes down the address and the name. Then he notes the number of appliances in the home and their type. The size of service line is put down, plus the number and capacity of the meter. The card contains space for comments on venting of the appliances, and the inspector fills this out too in each case. If an appliance or an installation is condemned this is marked on the card and stays there until his call-back finds the situation remedied, when the card is altered.

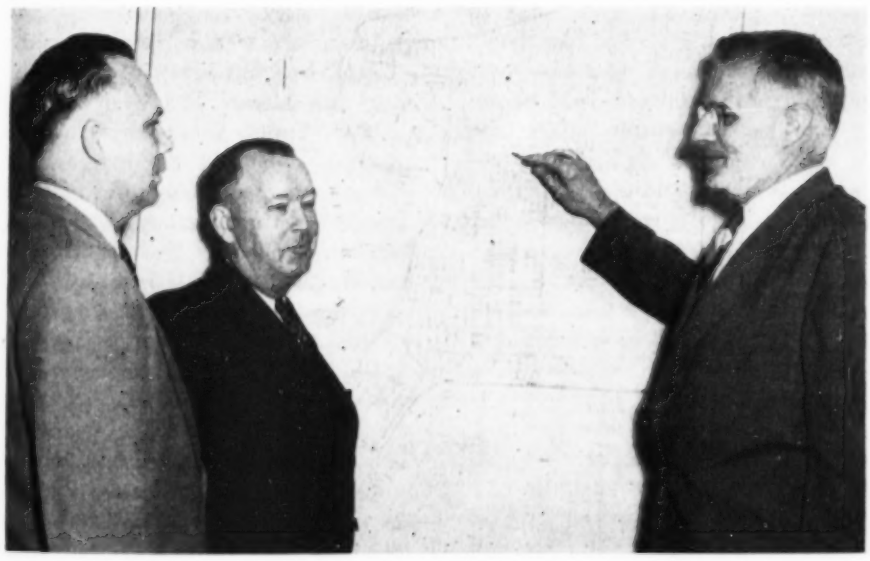
The cards are all kept on file and the next time the street is being checked on house-to-house canvass they are taken out, and the reverse side of it is used. Thus there is a double check available from year to year as to the number and condition of appliances in each house.

The cards, in fact, contain a complete inventory of the appliances on the lines, and the condition of the installation, in the entire district.

Complete inventory

"The biggest part of my job," says Nelson Romphf, "is safety and the maintenance of good relations with our customers.

"I feel that if you can make the truth clear in the case of a bad installation you will receive not only their cooperation, but their gratitude as well. This is especially true among families with small children, where danger and possibility of illness are of real concern."

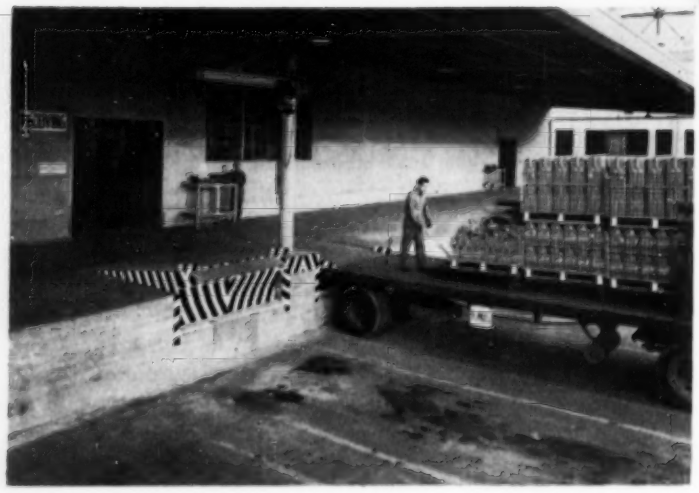


Inspectors Nelson Romphf (left) and Bill Shaw receive instructions from R. M. Shanks, Sarnia district superintendent.

Materials handling: 2

The fork lift truck

BEFORE



AFTER

A key to mechanization of expensive manual operations

By **FRANK CHAPMAN** • Editor

THE gas industry's materials handling problem is characterized by the great number of items of varying size and shape that must be received, stored and issued — a feature of the operation that makes it particularly suited to the use of the versatile fork lift truck. Taking cognizance of this the industry has, during the past few years, applied the fork lift truck to practically all of its stores operations and found that a more economical and more serviceable operation has been the result in nearly every instance. In addition, where fork lifts have been applied it has become evident that mechanization of the industry's storing operation, to an extent even greater than that now employed by the most progressive companies, can result in wider economies and still better service to operating departments. Such a program of complete mechanization must, however, be a part of the overall storing picture and it must be based upon a study of the gas industry's specialized requirements.

Because of the wide variety of articles that must be quickly and efficiently handled, the gas industry's storing problems differ from those of industry in general. In the manufacturing industry where a specific item or group of items of a specific type is handled, a standardized handling procedure, designed around a specific type of handling equipment, is usually worked out for each particular application. Conveyor belts and overhead conveyors are usually applied to the production-line handling of a specific item, dollies equipped with special holding arrangements are often used for special handling jobs and other similarly specialized handling arrangements are provided as they are required.

In the gas industry, on the other hand, where the major portion of the handling job has to do with materials of a great many sizes and shapes, there is no one standard equipment or method that is universally applicable. Because of its adaptability to a variety of jobs, however, the fork lift truck presents the most logical approach to the industry need for flexibility.

Only in the handling and repair of residential meters does the gas industry have the chance to apply assembly line of "manufacture type" handling techniques. The conveyor belt handling of meters for assembly line repair has been coupled with the mechanization of receiving, storing and shipping practices in some modern distribution company installations. In instances where this has been done the gas industry has turned to industry in general for some of the practices which have been proven successful in manufacturing.

Throughout all of the gas industry's storing operations the fork lift truck should be made the center of the mechanization program with the program built around it. This is in contrast to the practice, too often followed, of fitting fork lifts, along with other mechanized equipment, into the handling picture at random without any specific overall

plan or approach. Although a fork lift can be expected to improve the operation of any department to which it is applied, the maximum value of its use can only be realized when it is purchased and used as a part of an overall mechanization program designed to accomplish certain specific purposes.

Although there are certain considerations around which a program of mechanization is ordinarily designed that may well vary from company to company and from area to area, the basic principles of good practice in materials handling will be applicable to the industry as a whole and may be applied to any set of local conditions. One of these principles is design through mechanization to take advantage of the maximum unit load. Since one of the principal reasons for mechanization is to reduce the cost of handling, materials that can be moved from one place to another in the shortest length of time will acquire a minimum handling charge. The cost of handling is an inverse function of the maximum unit load in which the material can be handled.

Another of these basic principles has to do with the excessive handling of materials. The principle is not a new one to the industry but its importance is basic to the design of a mechanized handling program. Briefly the principle says that only the essential handling adds value to the article handled. The term "essential" is the important one in this definition for, instead of remaining static, it changes as new equipment and methods are devised. Before the time of the industrial truck it was "essential" in unloading a truck of residential meters to hand pass them from man to man. Before the adoption of the practice of providing major suppliers with pallets it was "essential" to unload and palletize materials on the company receiving dock. The least a company can do is to keep abreast of good practice in handling procedures and make use of those "essential" practices adaptable to its own operations so that it will not become involved in expensive, excessive handling.

Of great importance in the design of a mechanized storing operation is the availability of materials to operating departments. Service to the company is just as important to the whole operation as is concern over the costs of handling. One of the basic requirements of design for mechanization should be design for the ultimate in service.

Finally, the gas industry is no exception in its need for a stores operation that makes best use of the storeroom space allotted to it. To get the most out of a program of mechanization it must supply the means for "filling the cube" of storage space. Mechanization that does not provide for more fully taking advantage of available storeroom space is not in line with the best design procedures.

There are many local factors that enter into the mechanization of a storeroom operation. Among these are considerations with respect to the various locations at which handling is to be done, and the amount and type of material that is handled at each. It is also necessary to take into consideration the configuration and expanse of the service area. Details with respect to the type of storeroom space in use are essential in the design for mechanization. The floor loading, ceiling clearances, and ventilation are only three items that are of great importance in this respect. These are only a few of the many local considerations that must enter into the mechanization of a stores operation.

A degree of palletization with the use of the fork lifts is generally accepted practice at the present time with most gas company storerooms. The usual procedure involves palletizing material received on the company receiving dock, after which it is moved in and out of storage with a fork lift. This practice may be further modernized by setting up a plan whereby the major suppliers make their shipments available on pallets. The mechanics of the

COST COMPARISON: GASOLINE, LPG, AND ELECTRIC FORK LIFT TRUCKS
(4000 lb capacity)

	Gasoline	LPG	Electric With Lead Acid Battery	Electric With Alkaline Battery
Initial investment				
Truck chassis (4000-lb capacity at a 24-in. load center)	$3,800	$3,800	$5,100	$5,100
Alkaline battery				2,250
Lead acid battery			1,600	
Charger			1,100	1,100
Charger installation			100	100
Freight	100	100	200	200
Total investment	$3,900	$3,900	$8,100	$8,750
Annual fixed costs				
(a) Depreciation (straightline)				
Electric truck chassis (10 yrs)			510	510
Gasoline truck (5 yrs)	760			
LPG truck (7 yrs)		543		
Alkaline battery (10 yrs)				225
Lead acid battery (5 yrs)			320	
Charger (10 yrs)			110	110
(b) Interest on investment (5%)	195	195	405	437
(c) Taxes and insurance at 2% of investment	78	78	162	175
Total annual fixed costs	$1,033	$ 816	$1,507	$1,457
Annual variable costs				
(a) Power or fuel cost (260 working days/yr)				
Electricity for charging alkaline battery at 1¢/kwh (35 kwh X .01 X 260)				$91
Electricity for charging lead acid battery (30 kwh X .01 X 260)			$78	
Gasoline at 21¢/gal. (½ gal./hr, 8-hr day, 260 days/yr)	$218			
LPG at 16¢/gal. (.12 plus .04 to fill) (.57gal./hr, 8-hr day, 260 days/yr)		$190		
(b) Oil	62	31		
(c) Distilled water (for batteries)			10	10
(d) Labor for daily routine maintenance (fueling, oiling, changing batteries, etc.)				
Electric truck (1/6 hr/day at $1.75/hr)			76	76
Gasoline truck (1/3 hr/day at $1.75/hr)	152			
LPG truck 1/3 hr/day at $1.75/hr)		152		
(e) Major overhaul and maintenance (includes cost of parts and labor)				
Truck chassis	100	100	100	100
Alkaline battery (flushing and changing electrolyte)				25
Lead acid battery			50	
Gasoline truck engine (1 major overhaul per year)	300			
LPG truck engine (1 major overhaul every other year)		150		
Clutch and transmission	100	100		
Total annual variable costs	$ 932	$ 723	$ 314	$ 302
Total annual fixed costs	1,033	816	1,507	1,457
Total annual costs	1,965	1,539	1,821	1,759
Total initial investment	3,900	3,900	8,100	8,750

1. Load meters on cart for removal to dock. 48 handlings, 8 manhours

2. Move meters from storage area to dock. 1 handling, 1 manhour per 1000 meters

3. Load truck for delivery to division storeroom. 48 handlings, 4 manhours per 1000 meters

4. Unload truck at division storeroom. 48 handlings, 4 manhours per 1000 meters

5. Move from dock to storage area in division storeroom. 1 handling 1 manhour per 1000 meters

6. Unload and stock in storage area. 48 handlings, 4 manhours per 1000 meters

7. Load on cart. 48 handlings, 8 manhours per 1000 meters

8. Transfer to customer service dock. 1 handling, 1 manhour per 1000 meters

9. Remove old meter and deliver new. 96 handlings, 33 manhours per 1000 meters

10. Return meters to division storeroom. 1 handling, 1 manhour per 1000 meters

11. Unload meters and place in storage. 48 handlings, 9 manhours per 1000 meters

12. Load company truck for delivery to meter shop. 48 handlings, 4 manhours per 1000 meters

13. Unload truck at meter shop. 48 handlings, 4 manhours per 1000 meters

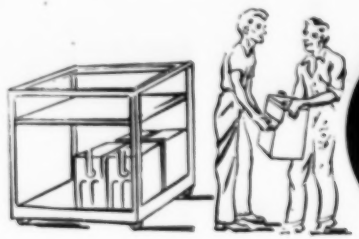
14. Transport from dock to meter shop. 1 handling, 1 manhour per 1000 meters

15. Load reconditioned meters on truck. 48 handlings. 4 manhours per 1000 meters

16. Truck to storage. 1 handling, 1 manhour per 1000 meters

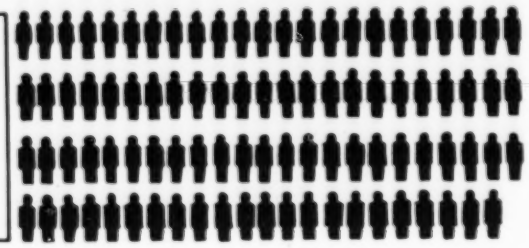
17. Move from dock to storage area in division storeroom. 1 handling, 1 manhour per 1000 meters.

18. Place in storage. 48 handlings, 4 manhours per 1000 meters



Problem
MANUAL HANDLING

91 Manhours
583 Handlings



1. ×

2. Move meters from storage area to dock. 1 handling, 1 manhour per 1000 meters

3. Load truck for delivery to division storeroom. 1 handling at 1.4 manhours per 1000 meters

4. Unload truck at division storeroom. 1 handling at 1.4 manhours per 1000 meters

5. Move from dock to storage area in division storeroom. 1 handling at 1 manhour per 1000 meters

6. ×

7. ×

8. Transfer to customer service dock. 1 handling at 1 manhour per 1000 meters

9. Remove old meter and deliver new. 96 handlings at 33 manhours per 1000 meters

10. Return meters to division storeroom. 1 handling at 1 manhour per 1000 meters

11. ×

12. Load company truck for delivery to meter shop. 1 handling at 1.4 manhours per 1000 meters

13. Unload truck at meter shop. 1 handling at 1.4 manhours per 1000 meters

14. Transport from dock to meter shop. 1 handling at 1 manhour per 1000 meters

15. Load reconditioned meters on truck. 1 handling at 1 manhour per 1000 meters

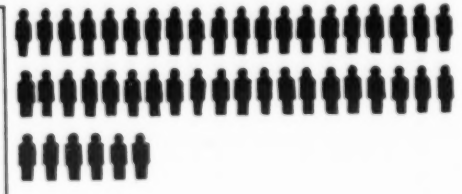
16. Truck to storage. 1 handling at 1 manhour per 1000 meters

17. Move from dock to storage area in division storeroom. 1 handling, 1 manhour per 1000 meters

18. ×

Solution
FORK LIFTS

46 Manhours
108 Handlings



plan involve furnishing certain suppliers with a constant supply of pallets so that a shipment may be palletized on the supplier's premises. When a gas company truck or a contract truck picks up the palletized load it also leaves a new supply of pallets.

Operation eliminated

In this manner the entire palletizing operation that would ordinarily take place on the gas company's receiving dock is eliminated. With the load delivered on pallets it is only necessary for the fork lift to unload the truck and move the material into storage. It is possible that this may be done in a single operation. The saving in time and manpower as well as the improvement in service with such an operation is obvious.

The practice will, of course, only be applicable to major suppliers and with those materials that lend themselves to palletization in the local storeroom conditions. However, with the use of the wire basket type containers there are a great many types of materials that may be received and handled in this manner. Valves and meters in bulk lend themselves to the wire basket type container. Packaged material such as stop cocks, nipples, and many small items of this variety are more readily adaptable to the ordinary wood or metal pallet. Pipe coating tar is another material that may be readily palletized for delivery. The list might be extended at length but local conditions establish the requirements for use in each instance.

Care must be exercised in the dispatching of pallets to the supplier's premises. In some instances a direct trade of pallets with the supplier may be made and a procedure worked out for this purpose can be of value to both the gas company and the supplier. However, the loss of pallets, particularly the wire basket type containers, can be expensive. In general it may be said that the practice is most successful with local suppliers with whom a constant and sizeable amount of business is carried on. It is not impractical, however, to establish such an arrangement with even a distant supplier. Material such as pipe coating tar and meters, for example, may well be shipped by rail from a distant point on pallets. If the railroad car can be unloaded on a company siding the handling of the entire load can be done in a minimum of time with a minimum of manpower.

The handling of residential meters is probably the most important of all handling jobs to a distribution company because of the number handled and the repeated handling that is required in a periodic maintenance cycle. It is in meter handling, therefore, that a distribution company should look first for some means of mechanization. Strangely enough it is with meter handling that the company often fails to take advantage of economies that will result from proper handling methods. Local conditions do not alter meter handling procedures to the extent that they do the procedures for handling other types of material. Techniques applicable in the handling of meters with one company can generally be directly applied to any other company's operation. For this reason it is possible to prescribe a somewhat specific method of meter handling that will be applicable to any distribution company. By the same token the same features of inefficient handling show up in many companies.

A hypothetical case of the way in which a meter might be expected to flow through a complete cycle from storage to a service connection and back through the meter shop to storage again can be set up to show the saving that may be expected from the modernization of this lengthy and expensive process. The flow pattern in this setup intentionally includes more than the average number of handlings. However, in this way it is possible to eliminate those operations that are not included in any local arrangement for meter handling. The amount of time allotted to each handling operation is an estimate based on average conditions. In one pattern the meters are handled by hand without the use of mechanized equipment and in the other the same pattern is used with a completely mechanized operation.

The cycle begins in a central storeroom where both new and reconditioned meters are stored and ready for service. It is assumed that customer service trucks operate out of the division storerooms and that it would be necessary to truck meters from the central storeroom to these sub- or division storerooms. On the return trip the meters are sent back to a central meter shop for repair and then placed in the storeroom from which they originated to complete the cycle. No meter shop handling is included for it is to be considered as a separate operation.

To establish some basis for working out a handling cost, a unit load of 48 iron meters is taken. In other words, by assuming that meters are handled in groups of 48, the operation of handling a unit of 48 by hand would be counted as 48 individual handlings whereas the handling of the 48 as a unit load on a cart or pallet would be counted as a single handling.

Handling time is computed on the basis of man hours-per-thousand meters. This estimate is developed by taking the approximate time required to move an individual meter or a unit load, whichever the case may be, and converting to total man hours required to move 1000 meters through the same operation.

In the case of non-mechanized handling, the 48 meters were handled a total of 583 individual times during the cycle, which resulted in a handling time of 93 man hours per thousand meters. The completely mechanized operation, on the other hand, required a total of 106 handlings for the same cycle at an expenditure of 46.6 man hours per thousand meters. Since 96 out of the 106 individual handlings that remain in the mechanized operation are required to take one meter out of service and replace it with another this figure represents a practically irreducible minimum. Any degree to which the manual operation can be mechanized will, of course, bring it toward this minimum figure.

Handling reduction

The reduction in handling is brought about by the following changes in procedures made possible through the use of a palletized unit load and fork lifts. With the meters palletized in storage, they are brought with a fork lift in unit loads of 48, transported to the loading dock, and loaded on a company truck in one operation that replaces 97 individual handlings in the manual procedure. Trucking from central stores to a division warehouse is practically unchanged. (See Page 50). When the truck load of palletized meters reaches a sub-storeroom it is unloaded and the meters placed in storage, again in a single operation that replaces 97 more individual handlings. When the meter is ready to be put into service it is picked up as a part of a unit load and taken to the sub-stores dock where it will be ready for the customer serviceman. Forty-nine individual handlings are eliminated in this process because

Consider the LPG fork lift

Buying—or thinking of buying—some fork lift trucks? If so, there are some very good reasons for patronizing an allied industry, LPG.

Sentimentality aside, fork lift trucks equipped to burn L. P. gas are showing definite advantages over the electric and gasoline-powered models. They are the newest fuel development in this field, and they are catching on with users at a quickening rate.

The best evidence of acceptance is the growing number of conversions that are being made by many leading users, who realize that the longer engine life, reduced maintenance, improved performance, lengthened oil life, and elimination of noxious fumes in exhaust gases more than offset the expense involved in converting.

In warehouses and other relatively confined spaces particularly, the health and comfort advantages are being recognized. Ralphs Grocery, a large chain of southern California supermarkets, began installing Beam LPG conversion kits on a few of their warehouse fork lifts. Soon the demand of the drivers for butane-fired models became so great that the entire fleet of 26 was changed over.

Two types of fuel containers are used across the country. One is permanently mounted on the truck, and is refueled directly from a storage tank. The other is a small replaceable cylinder of 5- to 7-gal. water capacity which is removed from the truck for refueling and replaced with a full cylinder. Recent Beam conversions are made so that a light comes on when the fuel supply is low, thus giving the operator ample warning before he runs out of fuel. Quick connecting couplings for this type of installation feature a double shut-off, allowing tanks to be changed without shutting off the motor.

it is no longer necessary to individually pick up the meters and place them on a cart or truck for delivery to the dock.

As the meters to be reconditioned are returned by the serviceman, they are placed in a waiting container or on a pallet on the loading dock. When the pallet or container is loaded it is moved to the storage area or put aside to await the truck from central storeroom. Another 49 handlings are saved by this operation. When the truck that is to haul the meters to the meter repair shop arrives at the sub-stores dock it is loaded in one handling rather than the 48 required in a manual operation. Unloading at the meter shop by unit load also saves 48 handlings, and movement of the meters from the shop into storage in one operation saves another 48. Pallets or containers in which the meters are delivered to the meter shop are used to handle reconditioned meters. Taking a look at the actual dollar savings in manpower that can be expected from this case of modernization, an example of the cost of excessive handling can be seen. Cost figures may be summarized as follows:

Cost of manpower required for manual handling of meters:

$195 per thousand or $.195 per meter*

Cost of manpower required for mechanical handling of meters:

$83.60 per thousand or $.0836 per meter.

Saving in cost of meter handling as result of mechanization.

$111.40 per thousand or $.1114 per meter.

Considerations omitted

The hypothetical meter cycle used in this example does not allow for the delivery of new meters into storage, or the handling of meters in the meter shop. Depending upon the physical relation of the central storeroom to whatever method of shipping is used for meters, ie., whether or not the storeroom has a rail siding if the shipment is by rail and the position of the receiving dock with respect to the storage area, one or more individual handling operations may be eliminated through the use of a palletized unit load and fork lifts.

Modernization also has a bearing on other costs not taken into consideration in the foregoing analysis. For example, it may be shown that a substantial amount of load and unload time may be saved in the trucking operation through the use of pallets or containers. Trucks are tied up for less time for loading and unloading when large unit loads are used. Also, the use of pallets allows a somewhat larger load to be handled by any one given truck. Whether company or contract trucking is used these items tend to reduce the costs of handling.

Meter shop modernization

The modernization of meter shop handling has been undertaken by numerous companies in recent months.* Again, the basic procedure is to make use of the unit load and handle as great a number of meters as possible by mechanical means. Meters delivered to the shop on pallets or in containers are removed to be put on the work bench. At the end of the reconditioning process the meters are painted and returned to the pallets for removal. In some instances a separate fork lift truck is assigned to the meter shop for this use only.

A practical approach to mechanization may be made by setting up and working out a skeleton outline of the meter handling procedure (or any other handling procedure, for that matter) in any given company. The outline can follow that set forth in the preceding hypothetical case. Time studies may be made in some instances to more nearly establish the man hours expended in any given operation. In some instances it may be sufficient to use estimates made on the basis of practical experience.

The figure that expresses the saving in dollars that can be expected from mechanization—the $111.40 per thousand shown in the sample—is multiplied by an estimate of the number of meters to be handled annually in thousands and balanced against the annual investment required for mechanization. The latter figure is determined as follows:

Cost of pallets or containers	xxx
Cost of fork lifts	xxx
Cost of skids and other equipment	xxx
Total investment required—	xxx

This investment is divided by the life expectancy of the equipment to arrive at a depreciation figure.

Annual cost is then:

Annual depreciation	xxx
Interest on investment (Based on current rate)	xxx
Total annual cost of mechanization	xxx

There are an unlimited number of

*These figures are based on an hourly rate of $2.00.

*See Production Line Speeds Meter Repair at Tulsa Shop; GAS, February, page 42.

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(Fork lifts — continued)

jobs around a gas company storeroom for which a fork lift truck is well suited. While an economic analysis such as the foregoing is worthwhile in developing an estimate of the time and money that might be saved through mechanization of a single phase of handling, some consideration should be given the fact that the fork lift truck purchased for this job will, even in the largest companies, also be used for numerous other handling jobs. The economic value of a fork lift, like most other types of equipment, is a function of the amount of time that it is used. One fork lift at a sub- or division storeroom will be able to do all the handling chores at that location including the handling of meters. At a central storeroom where several fork lifts are in more or less constant use, one of them will be used a good part of the time in handling meters.

Versatility increased

The versatility of the fork lift has been increased manyfold through the use of attachments that have been developed by the manufacturers. These attachments have permitted the use of the fork lift to be broadened past the limits of simply handling palletized material. A gooseneck boom or a simple cross-arm equipped with a hook has been put to wide use by the industry in handling large commercial meters. Fork lifts equipped with hoppers are used with all kinds of bulk materials along with a shovel scoop attachment. Any number of drum-handling attachments are available that can find wide use in the industry.

Handling of pipe

Of more than passing interest is the wide use to which fork lifts have recently been put in the handling of pipe. In certain pipe yard handling jobs the fork lift is more adaptable than any other kind of handling equipment. A 9-ton fork lift equipped with a special holding attachment is used extensively for handling sections of large diameter pipe. The attachment forces the pipe on to the forks and then holds it in position. It has been shown in some applications that a fork lift of this kind with a crew of two men will do the same amount of pipe yard handling as that previously done by a truck crane costing more than twice as much money with a crew of four men.

The ultimate success of a storeroom mechanization program making use of fork lift trucks depends upon the choice of the proper equipment for the job. In each instance the choice of equipment must be based upon the types of materials to be handled, the locations at which the handling is to be done and the physical features of the storerooms and yards in which the equipment is to be used.

The first consideration is, of course, the lifting capacity of the equipment. Since the load-raising arrangement in a fork lift truck works on a lever principle with the fulcrum at the center line of the front wheels, the effective lifting force decreases as the distance increases from the center line of the load to the center line of the front wheels. Thus a machine rated at 2000 lbs at 24-in. load center has a greater effective lifting capacity than a machine rated at 2000 lbs at 15-in. center.

Fork lift trucks are available in a wide range of sizes from the small walk-along types with capacities of from 500 to 3000 lb to huge machines with a capacity of 80,000 lbs. The heaviest unit loads encountered in gas company storeroom operations are rarely more than 3000 lb with the average falling around 1500 lb. The larger trucks are, of course, required for pipe yard handling.

Separate consideration

Those considerations that have to do with the conditions under which the truck must operate are so closely related to local conditions that each instance must be considered separately. For example, when ceiling height is limited it is necessary to use a truck that will provide the maximum amount of free lift, and when aisle space is limited only those trucks especially designed to operate in narrow aisles may be considered. Also, when the truck must operate on uneven or soft ground the choice is limited to a truck with pneumatic tires. Information with respect to all these matters is readily available from the manufacturer of fork lift equipment.

Aside from these local considerations the most important single item in making a choice is the type of motive power used. Although local conditions must

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KICKS THE ODOR

OUT OF GASOLINE ENGINES!

Virtually ELIMINATES deadly carbon monoxide from the air — used extensively in warehouses for safe, pleasant, indoor operation.

TRIPLES ENGINE LIFE — Allows use of oil up to ten times as long as with gasoline — saves up to 40% of your fuel bills — eliminates sludge and carbon — cuts downtime to a minimum.

NEW PLANT LOCATION

COMPLETE KITS FOR ALL LPG CONVERSIONS

Fork Lifts • Tractors • Trucks • Stationary Motors • Autos • Buses • Taxis

WRITE FOR FOLDER #418 on Fork Lift Conversions — **IT'S FREE!**

Best Buy BEAM! THE PARKDALE COMPANY

Manufacturers of BEAM LPG PRODUCTS

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is something
ALWAYS
missing?
(to cut your profit)

...then switch to the one line that meets every selling need

* **EXAMPLE No. 5:** Local distributor warehousing and service are other advantages you enjoy when you handle the Bryant line. Your Bryant Distributor is equipped to help you on sales calls . . . to offer technical assistance . . . to co-operate in local promotion . . . to promptly supply the equipment or parts you may need for any job. He is as near as your telephone. And his services are backed by competent factory district representatives, factory product specialists and traveling factory sales-training and service teams.

It will pay you to call your nearby Bryant Distributor today.

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HEATING | AIR CONDITIONING
WATER HEATING

1. The most complete line in the industry
2. Quality products—Competitively priced
3. Established name—Good customer acceptance
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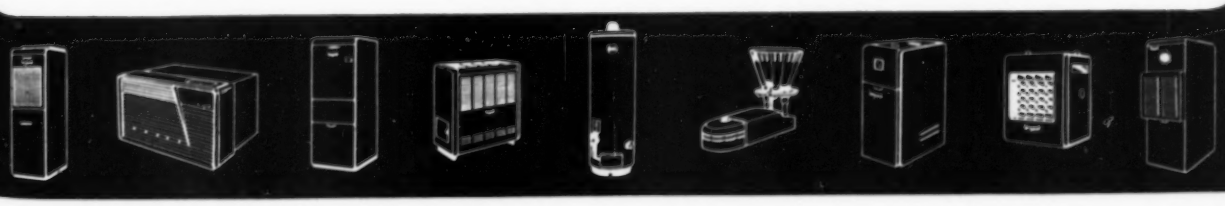
* 5. Local Distributor warehousing and service
6. Factory district representatives and traveling sales training and service teams

Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio



(Fork lifts — continued)

be applied, they can only be applied successfully when all of the factors with respect to the various types available are fully understood. Further, these factors must be fully appreciated in the light of the problems at hand.

A full range of conventional type fork lifts are available with gasoline, diesel, LPG or electric power. Although some gas-electric powered units are on the market they are subject to the same limitations as either gasoline or electric units used separately. In making a decision with respect to the proper motive power for any given local operation the matter of local operating conditions must be balanced against initial cost and cost of operation.

Motive power

The matter of motive power is an important consideration in those trucks that are to be used in confined locations. Gasoline and diesel powered trucks cannot be used in confined places because of exhaust fumes generated unless there is an effective forced ventilation system. Since LPG powered trucks produce about 65% less exhaust, and since the exhaust from an LPG engine is non-irritating and odorless there is less need for ventilation where these trucks are used. Gasoline, diesel or LPG powered trucks cannot be used safely near paint rooms or in other locations where there is danger from explosive vapors, while electric powered trucks are available which have completely shielded spark-proof motors.

In general, gasoline, diesel and LPG powered trucks are capable of traveling at speeds of from three to five miles per hour faster than electric driven trucks. This is not an important consideration when activity is confined to a relatively small area but saving in time will result where distances of 500 or more feet must be traveled. There is little variation in lifting speeds of the various types. However, the speed of an electric powered truck is not constant and varies with the condition of the battery. The electric truck will operate faster in the morning when the battery is fully charged than later in the day or after it has had hard use for a period of time.

Gasoline, LPG and diesel powered trucks will negotiate a much steeper grade with a full load than any of the electric trucks. A fully loaded engine powered truck can operate all day on a 16% grade while an electric powered truck would be unable to carry a battery of sufficient size to furnish power for any such operation.

Smoother operation

A smoother operation with less operative skill may be had from the electric driven truck because the motor is directly connected to the drive mechanism. An engine powered truck generally requires a clutch and train of gears to transmit power to the wheels and lifting mechanism. Electric powered trucks are from one-half again as heavy as comparable sized engine powered units. This is an important consideration when the unit is proposed for an older building that may have a reduced floor loading.

The fact that gasoline, LPG and diesel powered trucks can operate independent of a parent power source gives them a considerable advantage where operations require widely scattered use of the truck.

There remains for consideration, therefore, the matter or initial cost and cost of operating the various types of

John Crane *Plastic Lead Seal is the safest sealing compound you can use to protect persons and property against the hazards of leaky gas connections. It gives a positive and insoluble seal that is as permanent as the connection itself. Wherever the possibility of toxic or combustion danger exists, PLS is much more than economical insurance. It is a sound measure of *protection.*

PLS won't wash out . . . is impervious to all natural and manufactured gases, liquid petroleum products, steam and water . . . is not affected by weather changes or vibration . . . withstands temperatures to 500°F . . . pressures to 6000 psi. Yet, since PLS never hardens, it allows connections to be easily disassembled after years of service. *Approved by Underwriters' Laboratories.*

See for yourself why leading gas companies use PLS as their standard sealing compound. Send for a generous trial sample. No obligation. Crane Packing Company, 1805 Belle Plaine Avenue, Chicago 13, Illinois.

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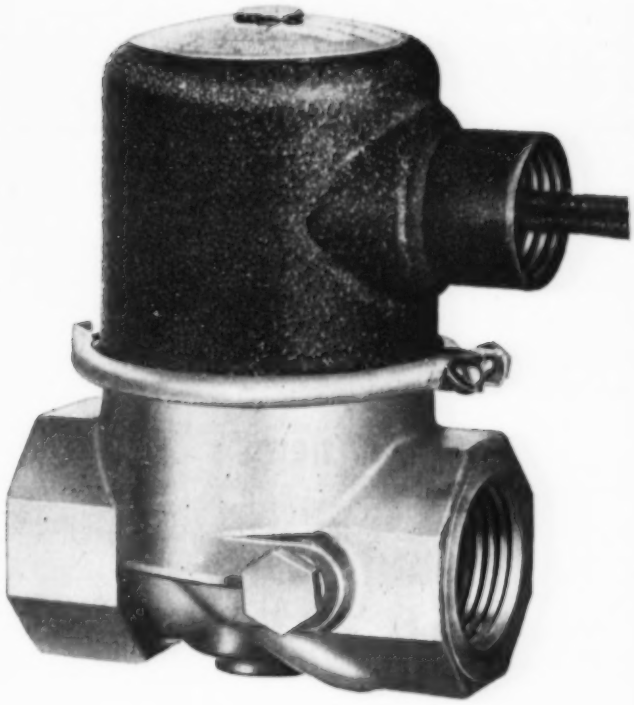
JOHN CRANE CRANE PACKING COMPANY

For your convenience: available in handy 1-lb. brush top cans.

K-3A ...better 4 ways



For 24 years the name "General Controls" has signified engineering ingenuity coupled with design simplicity. The K-3A Magnetic Gas Valve is an example. Designed for easy installation and maintenance, its conduit connection rotates 360 degrees and its coil is readily removable. It's tight, more positive closing is the result of a highly efficient solenoid, spring loading directly on the valve disc, and the use of gas pressure on top of the seat. Standard with synthetic valve disc that assures quiet, impact-noise-free operation. Available for any voltage or frequency and operable with any kind of commercial gas, this high capacity Magnetic Gas Valve has become the accepted standard for quiet operation of gas-fired equipment.

GENERAL CONTROLS

Plants in: Glendale, Calif., Burbank, Calif., Skokie, Ill.
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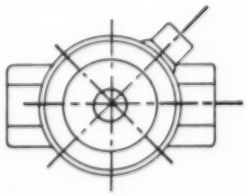
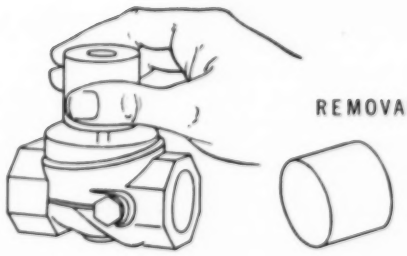
SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

K-3A Magnetic Gas Valve for automatic control of gas fired domestic and commercial applications. All voltages . . . all gases . . . available in valve sizes from ⅜ to 1¼ inches.

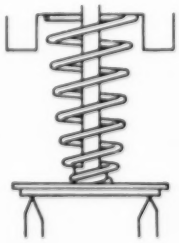
CONDUIT ENTRY ROTATES 360°



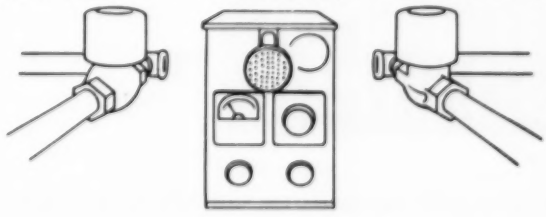


REMOVABLE COIL

SPRING LOADED TO SEAT FOR TIGHTER CLOSING



HIGH IMPACT • LOW SOUND, BY ACTUAL TEST



Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications

(Fork lifts — continued)

units. Although it is well known that a gasoline or LPG powered truck has a lower initial cost, it is equally well known that electric powered equipment has a lower maintenance cost, and that in most parts of the country a dollar spent for electricity will buy more energy than can be obtained from a dollar's worth of gasoline or LPG. The consideration with respect to the economics of the matter is more involved than this. The matter of costs depends upon a number of variables such as the number of units to be used, cost of fuel, number of hours per day that the machine will be used, length of haul, number and severity of inclines or ramps to be negotiated, and condition of the floors and runways.

On the average a gasoline, LPG or diesel powered truck chassis ready to operate can be purchased for approximately one-third less than an electric truck chassis of equivalent size which requires a battery and charging equipment before it can move. When the cost of the battery and charging generator is added in, the electric truck usually costs about twice as much as the engine powered truck. This relationship will vary with the size and type of battery and generator chosen.

Sketchy information

Information relative to maintenance costs of the various types of units is sketchy. There are more parts to a gasoline or LPG engine than there are in an electric engine, and more and closer adjustments are required. Battery and charging equipment manufacturers report that they sell about one cent's worth of spare parts for every dollar's worth of end item sold; while in the case of industrial type engines, it is reported that from 25 to 28 cents' worth of spare parts are sold for every dollar's worth of complete engine sales.

A considerable reduction in maintenance costs has been found in the use of LPG powered engines or gasoline engines converted to LPG. It is reported that fork lifts converted to LPG now operate more than a year between major overhauls, whereas while using gasoline it was necessary to make major repairs or overhauls about every three months. Also, where it was necessary to drain and refill the crankcase every 48 working hours because of the accumulation of cold sludge in gasoline engines, when the engine was converted to LPG there was no longer any such contamination. The life of a truck using LPG was found to be nearly double that of one using gasoline.

Little maintenance

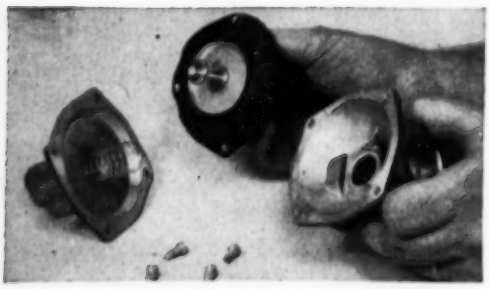
With electric trucks there is practically no maintenance on charging equipment and the normal maintenance expense on a battery is merely cleaning and watering. With respect to routine maintenance there is little or no difference between engine and motor powered units. Cost of maintaining the truck chassis would be about the same in either instance.

(The table on page 49 gives detailed information on the cost comparisons between gasoline, LPG, and electric fork lift trucks.)

The selection of fork lift equipment, therefore, is dependent upon the conditions under which the truck will be required to operate and on matters of cost.

Editor's note: Portions of this article are taken from an AGA purchasing and stores subcommittee report on the handling of materials by electric and gasoline fork lifts which was chairmanned by E. F. Hawkesworth of Southern California Gas Co.

improved performance new sales appeal for small gas appliances



Here's the new Maxitrol RV-41 regulator, designed to bring improved performance, new sales appeal to all small gas appliances. Small and compact, it features a non-metallic resilient valve seat that provides excellent lock-up characteristics in addition to accurate regulation over a wide range of inputs.

The RV-41 saves on installation time, too. Its breather orifice serves as its own leak limiting device in areas where these devices are acceptable. And, you can install the RV-41 in crowded, cramped places. All parts are available for servicing from the top. An inexpensive product that eliminates service call-backs, insures optimum adjustments for the life of the appliance. Maxitrol Company, 12200 Beech Road, Detroit 39, Michigan.

MAXITROL

Hallmark of gas heating progress

Tomorrow, as yesterday, you may look to MAXITROL for engineering and product leadership.

Sold on the Pacific Coast by PACIFIC SCIENTIFIC CO., San Francisco, Los Angeles, Seattle, Portland

remember!

ONE SERVEL SALE

means a

Double Profit for You!

1 SERVEL, the Gas Refrigerator, is different because it's the only refrigerator that makes ice cubes without trays and puts them in a basket . . . all automatically! The only refrigerator with no moving parts in its freezing system . . . stays silent, lasts longer. Only SERVEL Gas Refrigerators offer a ten year warranty . . . the longest and strongest warranty you'll find. No other refrigerator in the world has these outstanding sales advantages.

2 SERVEL, the Gas Refrigerator, forges the final link for the all gas kitchen . . . safeguards domestic load! The amazing, profitable SERVEL is also a constant source of steady, day-in and day-out revenue throughout the year. The SERVEL Gas Refrigerator with all its outstanding features will not only maintain that gas kitchen load but will further popularize gas . . . the modern fuel.

no messy ice trays!

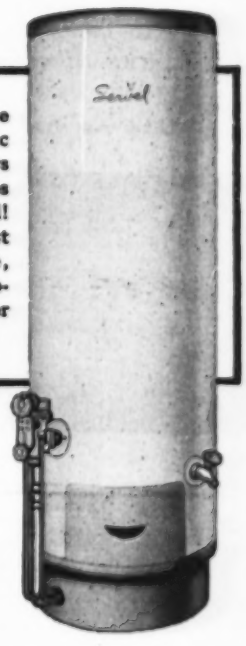
Simply pick the dry, loose, super-cold IceCircles out of the basket. The new Servel refills itself, then turns off, automatically! From automatic defrost, to the separate freezer compartment, to door shelves, to the trip-saver handle, this new Servel has every deluxe feature your customers ever wanted *plus* the refrigeration miracle of ice "cubes" without trays — automatically!

SERVEL AD DRIVE STARTS THIS MONTH!

Get complete information on how you can cash in on this great advertising and promotional drive with TV, radio, newspapers and billboards in your own local area!

SEE YOUR SERVEL DISTRIBUTOR TODAY!

A complete line of fully automatic gas water heaters in a range of sizes to fit every need! Servel — the most dependable, trouble-free automatic water heater on the market!



The name to watch for great advances in **REFRIGERATION** and **AIR CONDITIONING**

Servel

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Thermally Thinking

Continued from page 26

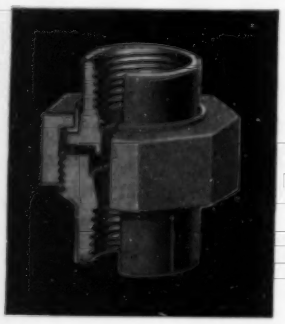
nents of the measure contended that it would result in an embargo on importation of gas from Canada under any circumstances.

Edward Falck, representing the Southern California Gas Co. and Southern Counties Gas Co. of California, stated that unrestricted interfuel competition has been the traditional policy. He said that Section 7 (e) of the act contains provisions adequate to protect the economy.

The Independent Natural Gas Association maintained that the bill would require the FPC "to act in derogation of the public interest in certain cases." A. J. G. Priest, who spoke for the Portland (Ore.) Gas & Coke Co., said the legislation, if enacted, would "seal off the border."

Counsel for the Senate group before which the hearings were held shared the view, apparently, that the Hunt Bill would prohibit importation of natural gas, in effect. He also wondered about the expression "economic dislocation," and whether or not the dislocation was to be judged from the local, state, or national standpoints.

As noted, the Hunt Bill does not have a chance this season. But if the coal interests ever give up, when they get started on a lobbying project, the lapse has ecaped the ken of careful reporters for many years. You may hear about this one again next year.



New CRANE Malleable Iron Insulated Union

Gives cathodic protection at meters—Galvanic corrosion in service piping can be effectively reduced by cathodic protection at meter connections. This rugged, malleable iron Crane union breaks the current path by means of special insulation.

Between union ring and tail-piece there's an L-shaped washer of laminated phenolic thermosetting plastic. Between tail-piece and thread-piece a thick black rubber gasket breaks the metal-to-metal contact. Both insulating parts have high dielectric strength.

New union measures just slightly longer than the regular ¾-inch Crane malleable union—approximately 2-7/32 inches, end to end. Packaged in cartons of 30.

Check your Crane Representative on these items!

New ¾-inch Safety Vent Elbows

A flexible stainless steel coil spring takes the place of the old bar grille or rigid screen in this new Crane vent elbow. Keeps out bugs, insects, foreign matter. Flexes outward if regulator is vented. Durable, dependable—die cast of zinc alloy.

CRANE

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VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Matters for Management

Gimmacks and gewgaws

Tucked away in the bottom desk drawer, under an apple core, a batch of old cigarette coupons, and the other oddments and impediments for which we in the editorial profession are noted, are a few blistering editorials which never had the satisfaction of reaching the linotyper's copy holder. Somehow, after the first blush of enthusiasm faded, they had lost whatever appeal they might have seemed to have had when first conceived. So they sit there, gathering dust.

More than one of these concerned itself with gadgets and gimcracks and gewgaws that any normal wise head would say were not worth writing about—any normal person, this is—but not the 160 million consumers of America. One of them pointed out what this unworthy thought he was alone in believing to be the basic weakness of today's gas range, to wit: it doesn't whistle, it doesn't ring bells, it doesn't have lights that flash. And it doesn't cost enough.

But now, we suddenly find we are not alone. Thank you, Lyle Harvey.

At the GAMA annual meeting in Chicago, in one of the most challenging and blistering talks it's been our pleasure to read, the president of Affiliated Gas Equipment had this to say:

"If we haven't built anything really exciting in the way of gimmicks, gadgets, bells, whistles, and whatnot into our product, that *creates obsolescence* as well as *provide sales ammunition*,

we can't expect the public to be very much impressed with our advertising . . . nor to be very insistent on brand names . . . nor to have the retailer or his salesmen be very partial to one brand in particular . . .

"We haven't been giving enough thought to creating obsolescence by creating gimmicks, by whomping up new, glamorous and exciting models, by making our present users dissatisfied with what they have . . .

"We have been trying to sell cotton stockings in a nylon market. No one can argue with any husband who has paid his wife's clothing bills that cotton hosiery is more practical . . . wears longer . . . mends easier . . . and is more practical on every count than these sheer, gauzelike, impractical nylon nothings that cost like the devil, get runs every time our sweet wives turn around, and in general are as indefensible from every standpoint as are these upstart electrical devices that are either outselling us or are scaring us to death."

Mr. Harvey might have dragged in some other outstanding analogies. What could be more obvious than the situation in the automotive field? Who today buys the stripped-down model in any line? Who cares about bore, stroke, piston displacement when you can invest more money in bucket-size taillights, headlights with drooping eyelids, portholes (which can be filled in if you care to pay something extra), and automatic window lifts that you can play like a harpsicord? Who cares about 235 horsepower unless you can hang a sign on the bustle advertising to the world that you're the guy that's got it?

The prettiest range we know has enough lights and controls on it to confuse the best million-mile airlines pilot. One of the most successful refrigerators has a door mother and daughter can play catch with. The best refrigerator has oddly shaped icecubes, and its advertising does NOT stress price or bottom-of-the-line merchandise. This baby goes after the quality market in spite of the fact that it uses that old, outmoded fuel (shhhhh!) gas.

Markets and neurotics

"A neurotic," said Mr. Harvey, "is a man who knows that two and two makes four, *but just can't stand it!*" So he titled his talk, "Wanted—More Neurotics!" in tribute to those who can't stand to see things the way they are.

Manufacturers of gas appliances must recognize, he said, that is "better to own a market than a mill."

"This is the era when modern factories can be designed and managed to produce any kind of goods in huge quantities at low cost, provided they can run steadily at capacity volume.

"This, therefore, is the era when one does most in operating the factory by properly managing what happens after the goods leave the factory. And if that is true, it is also the time when the product had better be designed, styled and provided with features which will improve the efficiency of selling, instead of being primarily for the purpose of increasing the efficiency of manufacture.

"The first thing to do about managing what happens after the goods leave the factory is to be neurotic about what is happening now. I hate to admit publicly that the gas industry as a whole is not really selling. We are manufacturing and delivering. When you sell, you go places, you get somewhere. We aren't going any particular place, and you know the figures show it.

A WIDER RANGE

. . . of Delivery Pressure Control

REYNOLDS HIGH PRESSURE LINE REGULATORS in parallel hookup have an increased range of capacity as well as a wider range of delivery pressure control. This also provides greater margin for emergencies. On inlet pressure the range is up to 650 pounds. For outlet pressure, this unit assures absolutely accurate and dependable control from 2 to 100 pounds. This variance in outlet pressure is made by use of different sizes of diaphram cases and further flexibility in the spring type is possible by use of different strength springs.

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Philadelphia, Pennsylvania

Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

"Ralph Cordiner of General Electric says that management is the science of establishing proper objectives and efficiently utilizing human, material and time resources to achieve the objectives.

"I get the idea that the gas industry has no firm objectives. We have *objections* to losing our position in the range market for instance, but I, for one, know of no positive or statistical *objectives* that the industry has either sought to establish or even agreed to seek. How can you begin to manage a market that you haven't even put a fence around? You can't under such circumstances begin to know what manner or amount of force must be brought to bear, or how it must be applied, in order to get results.

"I get the idea, too, that we have tried to manage the market by managing the factory. We have been striving for success by trying to make the short black end of the yardstick as short as possible under the quaint belief that this would make everything smooth and efficient out in the distribution-marketing arena. We in the gas industry can well qualify as a classic example of the 'cart before the horse'."

STOP THIS PROFIT EATER

Corrosion

WITH

AN-SPEC MAGNESIUM ANODES

Put a stop to profit loss from pipe system failure due to corrosion! Costly repair time and looking for leaks reduces profit and service to your customers. **An-Spec magnesium anodes** can prolong the life of your underground metal pipe systems by years. The most modern way to combat profit stealing corrosion . . . is by installing **An-Spec magnesium anodes** . . . your quality anodes . . .

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Cross-Curran, Ltd.
11102 Jasper Avenue
Edmonton, Alberta

Pipeline Supply Company
912 West 11th
Houston, Texas

ANODE SPECIALISTS
AN-SPEC

Current Reading

A SELECTED AND ANNOTATED BIBLIOGRAPHY OF NATURAL GAS—By Richard C. Henshaw Jr., statistician of the Bureau of Business Research ot the University of Texas. Mr. Henshaw, who was co-author of "The Economics of Natural Gas in Texas," has gathered here all references compiled during the writing of that book, including many sources that were not included in its bibliography. In addition it includes some items published since 1952. Subjects covered include: Economics of Natural Gas, Natural Gas Liquids, Petrochemicals, Reserves, Transportation and Storage, Taxation, Public Control, Conservation, and Competitive Fuels.

The bibliography is available from the Bureau of Business Research, University of Texas, Austin 12. Price $1.50.

HANDBOOK ON GAS REGULATION—Issued by Rockwell Manufacturing Co., this textbook on the theory of gas regulation and on the installation and maintenance of gas regulators has 154 pages and contains more than 120 drawings and photo illustrations.

The 11 chapters in the book cover the following subjects: fundamental principles of regulators; selection of type and size of regulators; regulator specifications and dimensions; operation of various types of regulators; installation procedures; maintenance procedures; regulator repair; regulator capacity tables; special applications and procedures; how to order regulators; and miscellaneous tables, specifications, and data.

Although only Rockwell regulators are specifically described, the book is devoted primarily to problems common to the entire field, methods of overcoming these problems, and other general information.

For more information write Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh 8.

DETERMINATION OF POROSITY BY A BUREAU OF MINES METHOD: A LIST OF POROSITES OF OIL SANDS (Report of Investigation 5025)—A rapid test for determining porosity of oil—and gas-bearing sands, developed by the Bureau of Mines, is described.

The method was devised at the Petroleum Experiment Station at Bartlesville, Okla. as part of the bureau's research on fluid-energy relationships and on methods of improving recovery of crude oil from underground reservoirs. Besides describing essential features of the test, the report presents new developments in the equipment used. It includes selected references to articles describing and evaluating various methods of determining porosity, as well as nine tables and five illustrations.

A free copy of the report can be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13.

Caloric's dramatically new built-in gas cooking units give new freedom in kitchen planning. Another Caloric product, planned to pay off for you . . . and like every Caloric appliance, it is planned exclusively for gas

No wonder Caloric built-in gas cooking equipment is gaining fast acceptance. It affords builders, architects and home owners an unmatched flexibility in planning kitchen layouts. Of course, these Caloric units offer the many advantages of gas equipment, including eye-level visibility for controls . . . and no worries about broiling with the oven door open. There's no doubt about it . . . feature for feature, dollar for dollar, built-in Caloric units offer more for less than any other on the market. Ask your Caloric representative to explain why Caloric built-in units are so vastly superior to all others.

Please send me complete information on the Caloric built-in gas cooking units.

Name_____

Address_____

Mail this coupon to Dept. G, Caloric Stove Corporation, Topton, Pa.

CALORIC

TOPTON, PA. — RANGES · DRYERS · DISPOSERS · BUILT-IN UNITS

NEWS

ConEd contemplates final conversion

Consolidated Edison Co. New York hopes to start work on Sept. 1 to convert the balance of its distribution system. At present about 30% of the gas energy supplied to consumers is natural gas.

ConEd presently obtains its gas from Transcontinental Gas Pipe Line Corp. and expects to get additional supply from Tennessee Gas Transmission Co. or Transco. An emergency tie with Algonquin Gas Transmission Co. already exists in Westchester county.

With the conversion, it is estimated that savings in cost of materials, labor, maintenance and pumping will be $4.7 million annually. The company is planning to amortize, over a 10-year period, the cost of changes to the distribution system and adjustments to customers' equipment at a rate of about $2.75 million annually.

Replacing manufactured gas with natural will bring about some radical changes in the company's operations. Coke production is being discontinued and the demolition of coke ovens is now under way. Water-gas plants are being modified for the production of high heat content oil gas to be used during emergencies or during extremely cold weather.

For many years ConEd has sold coke as a collateral business, inasmuch as the company made gas from the carbonization of coal. Now this by-product fuel business will be dispensed with and efforts will be concentrated on the sale of gas.

Utility regulation sought by Minnesota commission

In a bid to regulate utilities, the Minnesota Railroad and Warehouse Commission reports it has "received numerous inquires relating to public utilities over which neither this commission nor any other department has jurisdiction."

In a three-page letter to the legislative research committee's director of research, Secretary Oliver A. Ossanna said, "It is the belief of this commission that in view of the recent federal legislation which amended the natural gas act so as to give the several states certain jurisdiction over the regulation of gas rates, it now appears more necessary than ever that Minnesota should have some kind of regulation in order to be in a position to take full advantage of the exception that the federal law provides."

The commission made its first overture to regulate a larger field in its annual report, where gas and pipelines, airline traffic, and power and light were proposed as fit objects of commission supervision.

Combination washer-dryer pushed by Houston Natural

Because Houston Natural Gas officials felt that the new Bendix Gas Duomatic combination washer-dryer unit is one of the best sales potentials among the newer gas appliances, and because they were anxious to give the unit a rolling start, the company last month offered the washer-dryer for $75 down and 42 months to pay. After June, the terms returned to the usual: $75 down and 36 months to pay.

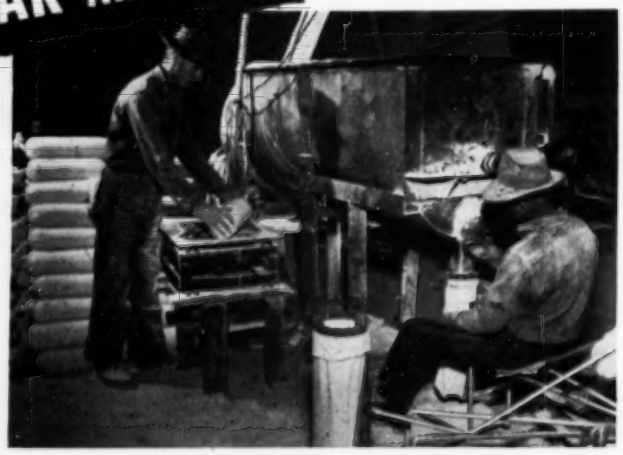
Utility advertising supported the advertising of dealers during the month to let the public know of the special terms. Wholesalers in Houston and San Antonio lined up dealer advertising.

Central Illinois Light celebrates centennial

Featured by Illinois' Gov. William G. Stratton and Abraham Lincoln, portrayed by State Representative G. William Horsley, as leading participant in a ceremony witnessed by thousands, Central Illinois Light Co. recently celebrated the centennial of the establishment of the first gas company at Springfield in 1854.

The reenacting of the lighting of the first gas street lights on the Court House Square

VIBRA-PAK ANODES



are proven cost savers

Corrosion engineers tell their own story how VIBRA-PAK anodes successfully lessen corrosion on submerged or buried metal structures. Here is an authentic case history, from the files of a major company telling how VIBRA-PAK anodes effectively and economically reduced installation cost on a 60 mile section of pipeline.

TESTIMONIAL

"After running a cost analysis on installation cost we found where any saving of time that could be affected made a decided change in the final cost per anode installation. By using an anode that didn't require recentering before installation we saved 5 man min. per anode or a cost saving of 10¢ an anode.

Yes Sir, that's what I call a real cost saver, Standard's VIBRA-PAK'd anodes."

— VIBRA-PAK anodes are spectrographically analyzed for metal purity . . . *your guarantee of longer serivce life!*

— a new, patented spiral core won't separate from anode . . . *positive contact is assured!*

— and remember, VIBRA-PAK means the anode is compacted and centered in the backfill through shipping, handling and placing it in the hole.

Represented By

Moorlane Company
Tulsa, Okla.
Kansas City, Mo.
Amarillo, Texas
Denver, Colo.
Wichita, Kansas
Oklahoma City, Okla.

Midwestern Engine & Equipment
Tulsa, Okla.
Pittsburgh, Pa.
Atlanta, Ga.
Chicago, Ill.
Oklahoma City, Okla.

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Midwestern, Inc.
Houston, Texas

Standard Magnesium Corporation
TULSA, OKLAHOMA

Pioneers of: SPECTROGRAPHICALLY ANALYZED ANODES AND CYLINDRICAL ANODES

Type 99

SCREWED or FLANGED CONNECTIONS

MULTI-PURPOSE PRESSURE REDUCING GAS REGULATOR

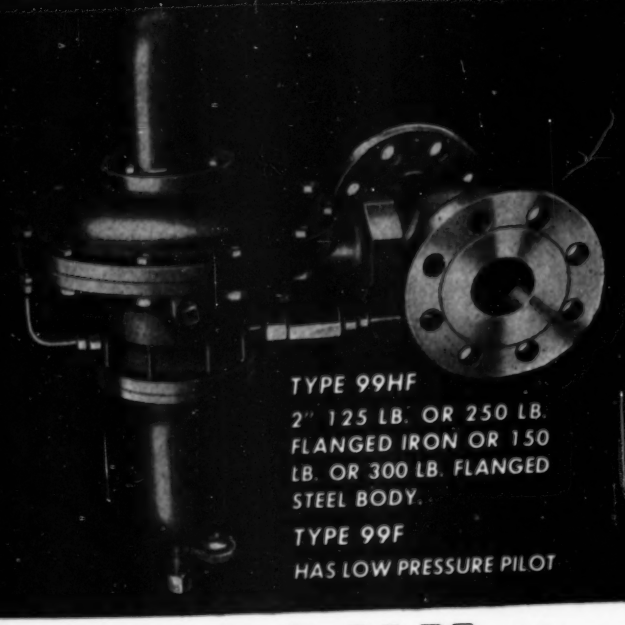
The Fisher Type 99 is truly a *multi-purpose regulator*—its versatility makes it adaptable to hundreds of applications now requiring an assortment of several types of regulators. It's as *handy* and *useful* as an extra vest pocket.

Because of its unexcelled performance and wide range of application, it is the ideal regulator to always have in stock.

For complete details, write for Fisher Bulletin P-99B.

FEATURES

- **Factory pre-set spring provides powerful lock-off action.**
- **Large, effective area of main diaphragm in combination with relay pilot assures trouble-free accuracy.**
- **2" threaded or flanged inlet and outlet. Hi-tensile iron, steel and bronze bodies for inlet pressures up to 250 PSI.**
- **Composition valve disc or O-Ring inner valve construction assures tight shut-off on zero flow and excellent regulation from no flow to maximum capacity.**



TYPE 99HF
2" 125 LB. OR 250 LB. FLANGED IRON OR 150 LB. OR 300 LB. FLANGED STEEL BODY.

TYPE 99F
HAS LOW PRESSURE PILOT

COMPANY Marshalltown, Iowa

FISHER Since 1880

BETTER GAS PRESSURE CONTROL

(the historical court house was the state capitol building a century ago) was carried out according to authentic history. A restored gas street lamp of that early period was installed on the courthouse lawn. In the course of the ceremony Abraham Lincoln, who was an attorney in Springfield in 1854, was taking his traditional evening stroll from his law office adjacent to the square and was joined by the lamplighter, in costume, making his evening rounds.

Wending their way through the assembled group, they joined the group on the speakers' stand where they were welcomed by the governor. Mr. Lincoln then spoke to the audience in the mood of 1854, referring to the marvels of this "modern" lighting. As a climax to his speech, he bade the lamplighter to proceed with lighting the first lamp. While the public square was darkened, the first lamp was illuminated.

Western States Utilities gets favorable ruling

Affirming a lower court ruling in favor of Western States Utilities Co., which sought to increase its rates in Waseca, Minn. to provide a "fair, reasonable and just" profit, the Minnesota supreme court has invalidated a section of the Waseca city charter that attempted to prohibit gas rates there that are higher than those in Albert Lea. The opinion is regarded as important with respect to the general public utility rate-making powers of the state's municipalities.

In 1949 Waseca's city council adopted a resolution permitting the gas company to charge higher rates than those in force in Albert Lea. Subsequently the council submitted a charter amendment to the voters that provided that the section be replaced by one providing for "fair, reasonable and just" rates. It was rejected.

Western States, in 1952, sought a rate increase but was turned down on the grounds that it couldn't be considered if the rates would be higher than those charged in Albert Lea.

The State Supreme Court held in its opinion that the power to regulate rates for services rendered by a business with a public interest lies with the state legislature. The opinion said the 1919 legislature delegated this power to cities of third and fourth class and that the law commanded the municipalities to set the rates to provide a "reasonable return on the capital investment" of the utility.

United Gas Corp. opens Monroe service center

A new service center, built with the primary purpose of accommodating the warehousing, service, construction, and transportation phases, has been opened by United Gas Corp. in Monroe, La.

The principal building in the service center is a combination office, service center, and warehouse. A garage repair shop, a smaller utility building, and an auto storage shelter make up the rest of the center.

A special feature of the center is an auditorium designed to seat approximately 100 persons. A modern kitchen at one end of the auditorium and an additional work kitchen just off this room provide completely modern facilities for the division's home demonstration activities.

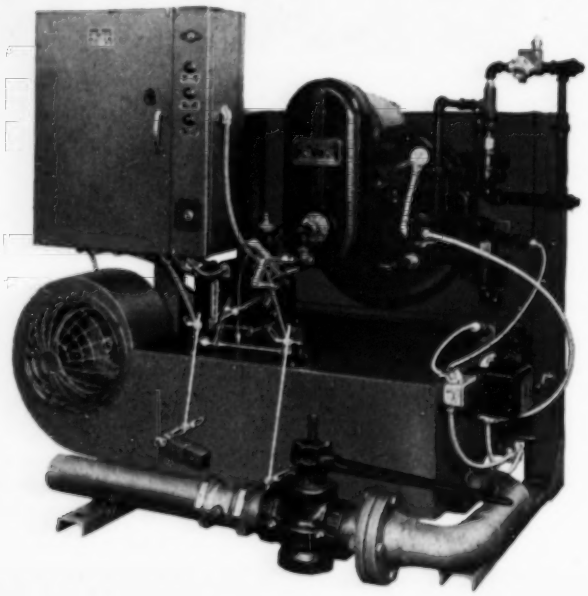
The garage contains a central working area, flanked by paint rooms and other facilities required in the upkeep of United's fleet of cars and trucks. A welding shop and other facilities are in the small utility building.

Identical requirements sought in Canadian lab

In commenting on the movement in Canada to set up a laboratory to test its own appliances, AGA President Earl H. Eacker believes that "We (the American Gas Association and the Canadian Gas Association) must maintain identical requirements regardless of the laboratories that may enforce them."

Mr. Eacker, speaking before the Canadian association during its annual meeting, said, ". . . I am convinced that it would be not only unwise but very harmful to the gas in-

WEBSTER ROTONETIC*



DUAL FUEL FIRING BURNER

- Sizes from 75 to 300 horsepower.
- Minimum gas pressure requirements.
- Low installation costs.
- Maximum efficiencies on BOTH gas and oil.
- Minimum base height requirements.
- Utilizes all grades of fuel oil.
- Extremely low noise level.
- Approved electronic combustion safeguard system.
- Simpler changeover than ever before.
- One hundred per cent forced draft.
- Completely assembled, piped, wired and tested.

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

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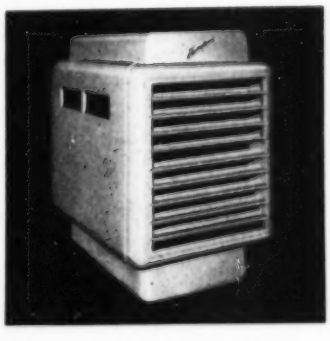
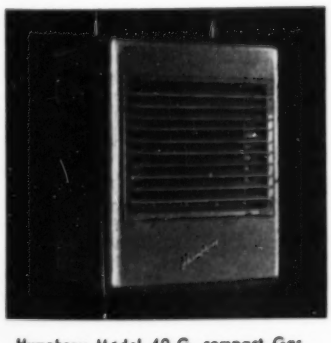
The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

The invisible label on EVERY Gas Unit Heater!



Humphrey Series A Automatic Gas Unit Heater. Choice of Rotor or Propellor fan, 65,000 to 200,000 b.t.u.



Humphrey Model 40-G, compact Gas Unit Heater in 17" x 22⅜" x 13¼" cabinet. 40,000 b.t.u.

Twenty-five years ago, Humphrey, already a leader in producing gas heating equipment for the home, originated and marketed the first Gas Unit Heater for business and industrial use.

In the years since, Humphrey engineers have led the way in developing improvements in design and construction required to meet ever higher standards of dependability and efficiency.

Heat exchangers with unrestricted, non-baffled interiors, for service-free operation without cleaning—stainless steel burner heads that increase service life and eliminate up to 100 lb. of dead weight—non-clogging pilots that operate dependably even under unfavorable conditions—all these and many other features have been Humphrey developed, on the basis of Humphrey experience.

Today Humphrey continues to lead in providing the refinements of construction that assure top efficiency and dependability.

Now as always, it is good business to make the Humphrey Gas Unit Heater your first choice. When you install a Humphrey you can be sure you are putting in the newest and the best.

GENERAL GAS LIGHT COMPANY

KALAMAZOO, MICHIGAN

dustry in both countries if standards for gas appliances varied in each country."

The Canadian's desire for a separate laboratory is understandable, however, and if it is found to be beneficial to Canadian companies, the move will have the wholehearted support of the AGA, according to Mr. Eacker. The American association recognizes the difficulties Canadian manufacturers have encountered in getting their products tested and approved because of distances involved and customs regulations.

The AGA Laboratories have supplied information to interested parties in Canada on the problems involved in the operation of national testing agencies. As Mr. Eacker sees it, the problem is one of volume and the industry "must decide whether or not it is economical and practical to establish a Canadian laboratory."

Houston Natural Gas installs 200,000th meter

Another growth milestone was passed by Houston Natural Gas Corp. recently when it installed its 200,000th gas meter in the town of Victoria, Texas. In observance of the occasion, and as a means of honoring the home and family that received the record-setting meter, Houston Natural presented the family with an automatic gas clothes dryer.

The company's first meter was set in Bellaire, in suburban Houston, in December 1925. In December 1947 its 100,000th meter was installed in Houston's Oak Forest addition. Frank C. Smith, the company's president, pointed out that what took 22 years to accomplish between 1925 and 1947, now has been done again in less than seven years.

Heating estimates reach 1.2 million families

Forecasts of approximately 1.2 million additional families heating with gas during each of the next three years exceed slightly the estimates for comparable period of time submitted one year ago, according to new estimates released by the American Gas Association. This gain reflects improved gas supplies, substantial easing of restrictions on new heating installations, and continued advantageous relationships with competive fuels in most areas.

New gas househeating installations during 1953 aggregated 1.2 million, according to AGA Bureau of Statistics. This raised the total number of homes heated with utility gas at the end of the year to 12.9 million, equivalent to 50.9% of all residential gas consumers. Of more significance is the fact that existing gas heating customers represent 61.3% of all residential gas users considered to be part of the currently existing potential market for gas househeating.

As of the end of 1953, there were 88 utility companies, serving 9.1 million residential customers, or 36% of all households served by the industry, which still had in effect restrictions of some kind on new heating installations. One year earlier a total of 120 companies, serving 10.2 million families, were under restrictions. Increased supplies of gas and significantly expanded underground storage facilities are expected to reduce the restricted areas still further in the near future.

The most significant increase in anticipated new heating customers will occur in the East North Central area, principally in Illinois and Michigan. Additional supplies of gas in that area will permit a total of 990,000 new heating customers to be served during the next three seasons. New connections for gas househeating will reach nearly 400,000 in the third year.

From a percentage standpoint the most rapid growth is anticipated in New England. The connection of an estimated 133,000 new heating customers by the end of 1956 will more than double the number of such customers served by the industry in that area at the present time.

Data shown in the AGA survey represent industry totals based on reports received from 278 utilities serving 92% of the residential gas customers in the country. Utilities were requested to indicate the potential

ANTICIPATED ADDITIONAL GAS HOUSEHEATING CUSTOMERS IN THE UNITED STATES, BY STATE, 1954-1957

(Thousands of Customers)

State	1954-1955 Heating Season			1955-1956 Heating Season			1956-1957 Heating Season		
	Total	New Dwelling Units	Existing Dwelling Units	Total	New Dwelling Units	Existing Dwelling Units	Total	New Dwelling Units	Existing Dwelling Units
United States	1,175	656	519	1,214	650	564	1,245	636	609
New England	41	9	32	43	10	33	49	11	38
Connecticut	8	2	6	9	2	7	10	2	8
Maine	a	a	a	a	a	a	a	a	a
Massachusetts	25	6	19	25	7	18	29	8	21
New Hampshire	2	a	2	2	a	2	3	a	3
Rhode Island	6	1	5	7	1	6	7	1	6
Vermont	a	a	a	a	a	a	a	a	a
Middle Atlantic	216	89	127	177	79	98	171	77	94
New Jersey	43	31	12	44	31	13	44	30	14
New York	102	24	78	71	17	54	66	16	50
Pennsylvania	71	34	37	62	31	31	61	31	30
East North Central	259	88	171	353	107	246	378	107	271
Illinois	69	20	49	113	14	99	140	15	125
Indiana	29	10	19	36	15	21	36	15	21
Michigan	17	9	8	117	41	76	117	41	76
Ohio	143	49	94	76	34	42	70	33	37
Wisconsin	1	a	1	11	3	8	15	3	12
West North Central	119	59	60	125	56	69	136	50	86
Iowa	30	5	25	23	4	19	21	4	17
Kansas	20	17	3	15	14	1	12	12	a
Minnesota	31	11	20	28	11	17	25	10	15
Missouri	25	20	5	39	19	20	63	17	46
Nebraska	9	4	5	16	6	10	10	5	5
North Dakota	1	1	a	1	1	a	3	1	2
South Dakota	3	1	2	3	1	2	2	1	1
South Atlantic	90	64	26	81	56	25	78	54	24
Delaware	1	1	a	1	1	a	1	1	a
District of Columbia	3	1	2	3	1	2	3	1	2
Florida	5	3	2	5	3	2	5	3	2
Georgia	25	21	4	24	19	5	22	18	4
Maryland	22	14	8	20	14	6	19	13	6
North Carolina	8	5	3	9	5	4	9	5	4
South Carolina	3	2	1	3	1	2	4	2	2
Virginia	15	12	3	14	11	3	13	10	3
West Virginia	8	5	3	2	1	1	2	1	1
East South Central	48	32	16	51	34	17	48	34	14
Alabama	5	3	2	6	3	3	5	3	2
Kentucky	18	13	5	20	15	5	20	16	4
Mississippi	11	9	2	13	10	3	13	10	3
Tennessee	14	7	7	12	6	6	10	5	5
West South Central	172	116	56	166	117	49	162	115	47
Arkansas	15	3	12	11	3	8	10	3	7
Louisiana	21	14	7	22	15	7	21	14	7
Oklahoma	17	16	1	16	15	1	16	15	1
Texas	119	83	36	117	84	33	115	83	32
Mountain	64	43	21	56	39	17	49	34	15
Arizona	19	14	5	17	14	3	16	14	2
Colorado	17	14	3	14	11	3	10	8	2
Idaho	a	a	a	a	a	a	a	a	a
Montana	7	1	6	5	1	4	6	1	5
Nevada	a	a	a	a	a	a	a	a	a
New Mexico	12	9	3	11	8	3	8	6	2
Utah	7	3	4	7	3	4	7	3	4
Wyoming	2	2	a	2	2	a	2	2	a
Pacific	166	156	10	162	152	10	174	154	20
California	164	154	10	161	151	10	162	152	10
Oregon	1	1	a	a	a	a	a	a	a
Washington	1	1	a	1	1	a	12	2	10

a. Less than 500 customers.

NOW THE 2 NEWEST, MOST IMPORTANT GAS RANGE SALES FEATURES SINCE OVEN HEAT CONTROL!

NEW Robertshaw®

POTWATCHER®

—it turns off top burner AUTOMATICALLY!

It's a watch—controlled 60-minute timer

It's a gas valve

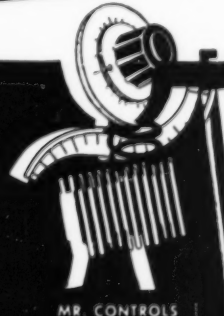
NEW Robertshaw

TEMP'N TIME®

—it turns off oven AUTOMATICALLY!

It's an oven thermostat

It's a watch—controlled 4-hour timer



COMPLETE PROMOTIONAL HELPS available, including national advertising, point-of-sale material, newspaper ad mats, consumer booklets, etc. Ask your range manufacturer!

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ROBERTSHAW THERMOSTAT DIVISION, Youngwood, Pennsylvania

for gas househeating among their existing residential users.

Many such customers occupy units in multi-family structures served by one central heating unit which is physically not adaptable to gas heating. Some occupy dwelling units where even the most favorable prospective gas price would be sufficiently disadvantageous to anticipate its price. Data relating to potential heating customers reflect these two limiting factors. Furthermore such data exclude the potential market to be created by new construction in the future and by initiation of gas service in existing housing not currently using gas for any purpose.

Rockwell's Texas plant goes into production

Production of steel Hypreseal valves in sizes up to 4 in. and in pressure ranges up to 10,000 psi is under way at Rockwell Manufacturing Co.'s new 116,000-sq ft manufacturing plant at Sulphur Springs, Texas. The new facilities will serve users of valves, meters and other Rockwell products in the petroleum, natural gas, chemical, and petro-chemical industries in the Southwest and South.

The completely air-conditioned plant will eventually produce valves in other types and sizes as well as meters and other Rockwell products. By the end of 1954, when full production will be reached, employment is expected to be approximately 150.

Year round temperature and humidity control will enable the maintenance of rigid quality control and product uniformity for all production. Exclusive of plant equipment, the structure cost in excess of $1 million. The new plant will also house research, development and engineering functions for Rockwell-Nordstrom valves in sizes up to 4 in.

P. E. W. Goodwin Jr., formerly manager of outside manufacturing at Rockwell's Oakland (Calif.) plant, has been appointed general manager in charge of operations at Sulphur Springs.

LOST?

WE FOUND IT!
IT IS DOWN IN TEXAS!

The Best Insulated Pipe Union in the World (Texas Too!)

• Sizes — ½" thru 4" inclusive • Pressure Rating —300 #W.O.G. • Insulate Domestic meter loops • Insulate well flowlines • Economical in price • Available from stock

All Threads Metal to Metal — No Plastic Threads To Strip Out

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Optimistic note continues in common stock prices

Composite prices of 30 natural gas company common stocks on May 28 continued to reflect the generally optimistic tone of the market, according to the AGA report. On that date, the composite price was approximately 15.9% higher when compared to the similar period one year earlier. Coupled with this increase in price, dividend payments advanced 4.9%, resulting in a relative decline of 9.5% for yields on these stocks when current periods are compared to a year ago.

The price of the 10 gas transmission company stocks increased 13.2% over last year, while the price of the 10 gas distribution company stocks increased 18.2%. Accompanying these price changes were increased dividend payments of 2.4 and 10.4% for the companies comprising the transmission and distribution components of the index. Because of the greater relative increase in prices than in dividend payments, yields declined 9.5% and 6.5% for transmission and distribution companies, respectively.

All central heating shipments increase

Shipments of all three types of gas-operated central heating equipment increased during April over the previous month, according to latest GAMA estimates. During the month 41,700 furnaces were shipped, 5100 more than in March and 4400 more than in April 1953. The figure brings the total for 1954 to 140,900 units, compared with 130,500 for the same period last year.

Gas-fired boiler shipments in April numbered 4300, compared with 3900 the previous month. Conversion burners increased from 7900 in March to 16,500 in April, for a four-month total of 41,400.

This upward trend was not apparent in range shipments, however. During April, approximately 170,400 units were shipped, 22.7% less than in April 1953. The four-month figure stands at 638,100 as against 783,600 last year.

Shipments of automatic gas water heaters

reached a new high for the past 12 months during April, when 203,100 units were shipped, a gain of 15,300 over March. The April figure increases the total of water heaters shipped during the first four months of the year to 730,300, which is still below the 779,900 shipped during the same period last year.

Sixty percent of Peoples' customers heat with gas

The popularity of gas heating in the western Pennsylvania area served by the Peoples Natural Gas Co., Pittsburgh, was brought into sharp focus with a report revealing that of 230,965 customers, 139,402 use gas for heating. Saturation percentage disclosed was 60.4.

Among the 18 major areas served by Peoples, Pittsburgh had the higher number of customers using gas for heating, with a saturation percentage of 81.4. Glenshaw, where 76.5% of Peoples' customers use gas for heating, ranks second.

Other areas included Aliquippa, 61.2% saturation; Altoona, 39.4; Blairsville, 46.1; Burgettstown, 40.7; Glassport, 68.8; Greensburg, 55.5; Indiana, 45.3; Johnstown, 48.7; Kittanning, 46.4; Latrobe, 58.7; Midland, 66.2; Monessen, 47.4; New Kensington, 58.2; Point Marion, 44.7;Vandergrift,42.3; and Wilkinsburg, 73.6.

News Notes

W. H. T. Furry has been named director of the training and educational division of the Foxboro (Mass.) Co., succeeding Malcolm B. Hall, who recently completed 40 years of service with the company. In addition to its program of academic cooperation with engineering schools and colleges, the division operates the Foxboro training school. The school, established in 1935, is one of the first institutions of its kind devoted exclusively to training customers' men in the proper use and maintenance of instruments.

Long service is a characteristic of Pacific Gas & Electric Co. employees. The San Francisco company reports that 12,355 of the company's 18,000 workers have been with it for at least five years. One out of every five PG&E men and women has been on the company's rolls in excess of 20 years. There are 14 who have more than 45 years' apiece; 112 have been at work 40 years. A total of 276 have 35 years behind them and 1181 joined the company 30 or more years ago.

All West Coast operations of Servel Inc., Evansville, Ind., have been centralized in a new Los Angeles location at 5545 E. Slauson Ave. Office space and warehousing facilities for the company's appliance, air conditioning, and commercial refrigeration divisions will be provided at the new site.

National Petro-Chemical Corp. has begun construction on its polyethylene unit at Tuscola, Ill., which is expected to be on stream in the spring of 1955. Existing facilities are being modified to provide the extremely pure ethylene required for production of high quality polyethylene. In anticipation of expanding polyethylene markets, the facilities have been designed to permit a rapid expansion in production to three and four times the original capacity.

Ten years of freedom from accidents in the Tuskegee, Ala. plant of the Alabama Gas Corp. have been recognized by the American Mutual Liability Insurance Co., which presented a 10-year safety certificate to the company under date of June 26, 1952. According to Earl L. Doster, local manager, up to the present time no lost-time accidents have occurred.

Iowa Illinois Gas & Electric Co. will install a $600,00 LPG plant in Cedar Rapids. The plant will include 15 storage tanks with 30,000-gal. capacity.

The Rhode Island legislature has rejected a bill that proposed establishment of a consumers' council designed to protect the public interest in rate increase hearings and living cost changes. Opponents said that as

Lancaster S-7 GROOVE TYPE METAL RIM DIAPHRAGM

Performance advantages of the Lancaster S-7 mean a closer to 100% overall accuracy — and an extra margin of profit. Patented Lancaster features and superior quality construction add up to more years of service in the meter — and another margin of extra profit.

If you are not using the Lancaster S-7 groove type metal rim diaphragm for your small meter repairs and replacements, write for a sample today.

Lancaster METER PARTS CO.

POST OFFICE BOX 378 • LANCASTER, OHIO

far as public utility rate cases were concerned, the proposed council would largely duplicate the function of the state public utility administrator.

Widely scattered warehouses, meter shop, garage, engineering offices of Arkansas Louisiana Gas Co. will be grouped in a new $350,000 two-block plant in Little Rock. The company expects completion of the facilities by Sept. 1.

During April, total utility and pipeline gas sales to ultimate consumers were 5134 million therms, 4.1% higher than the 4931 million sold in April 1953. The AGA reports that natural gas sales in April aggregated 4810 million therms, up 4.1% over the 4619 million sold last April Manufactured and mixed gas sales totaled 325 million therms, a 4.1% gain over 312 million in April 1953. Total sales of the gas utility and pipeline industry to ultimate consumers during the 12 months ending April 30, 1954, were 58,167 million, up 8.0% over a like period last year.

In its annual report to stockholders, Metropolitan Life Insurance Co. reveals that it has invested $547 million to help bring natural gas to communities throughout the country.

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CARBOSEAL
TRADE-MARK
ANTI-LEAK
STOPS
GAS-MAIN LEAKAGE

. . . a 16 mm. color-sound movie that shows the ease, economy, and effectiveness of CARBOSEAL anti-leak — the answer to leakage from jute-packed bell joints in dry-gas systems. It will be sent to you without charge — on request.

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A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N.Y.

"Carboseal" is a registered trade-mark of Union Carbide and Carbon Corporation.

Milwaukee Gas trains men for top rating

UNDER what is believed to the first company sponsored employee training program of its kind in the country, the Milwaukee (Wis.) Gas Light Co. is giving 167 of its servicemen free technical training at the Milwaukee School of Engineering.

When the men successfully complete the special gas service course, they will become eligible on a seniority basis for a newly created classification of senior serviceman. Sixty positions have been set up in that classification.

Only by taking the special technical course can an employee qualify for the new classification, according to John J. Dolan, vice persident of the company in charge of personnel.

The company is paying all cost of the course, including tuition and textbooks. Employees attend school on their own time. Most of them take night classes, although special day courses have been set up for those working night shifts. Some servicemen go to school twice a week, others once. Some will finish their special training in two semesters, others in three or four semesters.

The length of time required to complete a training program depends upon how many courses a serviceman must take. Each man's program has been based upon the results of special tests given recently to the servicemen. The tests, as well as the curriculum, were developed by the Milwaukee School of Engineering staff with the assistance of members of the school's 69-man industrial advisory committee.

When an employee finishes his course, he will receive a certificate making him eligible for the senior serviceman rating. The company will accept the certificate without question as evidence that the employee is expert in servicing all

Fundamentals of gas and gas appliance servicing are among subjects.

types of domestic gas appliances.

Actually, 43 employees proved in their test that they qualified for senior servicemen. They were given the senior serviceman classification immediately. Nevertheless, they are voluntarily attending certain classes in the training program because of a desire for even greater proficiency.

The plan, covering men who service domestic appliances, was worked out with the cooperation of Arthur St. John, president, and members of the bargaining committee of Local 18 of the United Gas, Coke & Chemical Workers of America (CIO); Henry J. Dropp, director of operations for the company; Karl O. Werwath, president of the school; and Mr. Dolan.

One-call basis

Mr. Dropp points out that one senior serviceman will be able to completely and efficiently service any new appliance on a one-call basis, thereby eliminating call-backs, which resulted under the old system of serviceman training.

"The Union agreed, under this new program, to permit one man to install and service all gas appliances," he explained. "Formerly, two men were used for this work and in most cases only one man was necessary to complete the job. This action will result in lower service costs to the customer and will permit the dispatching of work in a much more efficient manner. With service trucks equipped with two-way mobile telephones, servicemen in the field will be able to answer the emergency calls within a few minutes after they come through the dispatch tower."

Among the subjects being taught at the school are fundamentals of gas and gas appliance servicing, dc and ac electrical circuits, refrigeration and heating control systems for gas appliances.

Results of a placement examination given to the servicemen were used as a guide to the school in grouping men of equal experience and educational levels for the various classes.

Refrigeration and heating control systems are covered.

20 Bell Holes Like This in One Day with a SHERMAN POWER DIGGER!

"Pay for themselves faster than most of our other equipment!" That's what R. Mannino & Sons, Westfield, New Jersey general contractors say about their Sherman Power Diggers.

A typical Mannino job was for the local gas company. Replacement of clamps and seals on gas mains required digging a series of bell holes. The Sherman Power Digger reduced digging time for the average bell hole to about fifteen or twenty minutes, making it possible to replace as many as twenty clamps a day.

If you now excavate by hand, or if your heavier equipment cannot work in tight spots, you, too, will find the versatile Sherman Power Digger practical and profitable. It's compact, flexible, fast, easy to operate. It digs in a fraction of the time and cost of manual labor—as deep as 10′ below grade in mud, hard-pan, shale, oiled roads, blacktop and stony ground.

Initial cost of the Sherman Power Digger is surprisingly low, maintenance simple and inexpensive. Write today for the whole story. Ask for Bulletin No. J-15.

Designed, Engineered and Manufactured Jointly by
SHERMAN PRODUCTS, Inc.
Royal Oak, Michigan
WAIN-ROY CORPORATION
Hubbardston, Mass.

Patent No. 2,303,852
Other patents pending
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Sherman
PRODUCTS, INC.
ROYAL OAK, MICHIGAN

ASSOCIATIONS

GAMA predicts good year at 19th annual convention

Forecasts of a favorable sales year despite a slow start, and determination to actively combat adverse gas legislation highlighted GAMA's 19th annual convention held recently in Chicago. The 315 registrants unanimously approved a resolution condemning the Hunt bill now before the U. S. Senate Commerce sub committee that would prevent the expansion of the natural gas pipeline into the Pacific Northwest by banning the export and import of gas.

T. T. Arden, executive vice president of Grayson Controls, was elected president of GAMA, succeeding Sheldon Coleman, of the Coleman Co., Wichita. The entire slate of new officers, division and group chairmen and vice chairmen will assume their duties next October.

Also elected to GAMA office was W. F. Rockwell Jr., Rockwell Manufacturing Co., 1st vice president, and A. B. Cameron, Ruud Manufacturing Co., 2nd vice president. Lyle C. Harvey, Affiliated Gas Equipment, was reelected treasurer.

In his keynote address, President Coleman said that many of the delegates were optimistic over appliance sales potentials, despite a low first-quarter start because they intended to balance this by increasing their advertising and promotional activity at the local level. He warned the group, however, that the gas appliance business must undergo some self-improvement. He pointed out that the profit margin for the industry as a whole is 5% while for the gas appliance industry it is only 2½ to 4%.

President-elect T. T. Arden looks on as Sheldon Coleman (right) presents James Donnelly with GAMA's meritorious award.

Later during the convention, Mr. Harvey, who also serves as chairman of the GAMA Gas Industry Development committee, took some manufacturers to task for their apathy toward the 10-city demonstration program. He warned that manufacturers concentrate too much on the manufacturing end of the business and not enough on the distribution of their products to the ultimate consumer.

Four new divisions were formed during the convention. The division and their chairmen are: conversion burner, E. P. Hayes, C. A. Olsen Manufacturing Co.; gas boiler, N. E. Westphal, Weil-McLain Co.; recessed heater and floor furnace, Ralph E. Solomon, Samuel Stamping and Enameling Co.; and gas furnace, G. M. Denges, Williamson Heater Co.

Among board members at the GAMA convention were (from left): D. E. DuPerow, Lincoln Brass Works, Detroit; E. S. Munson, Royal Jet Inc., Alhambra, Calif.; and Lyle C. Harvey, treasurer of GAMA and president of Affiliated Gas Equipment Inc., Cleveland.

ARCCO
ARCCO CANNON NEVER-DRY PEN
Writes for Months
REPLACES OTHER MAKES • USES REGULAR INKS
Regardless of pulsations or other causes of ink failures this new Never-Dry Pen will make clean and complete records. Ink supply lasts for several months without refilling reservoir. Capillary tube from ink bottle placed in instrument case feeds pen with continuous flow. Closed system sealed from atmosphere prevents clogging and dirt accumulation.
Weight of pen is constant at all times thus insuring extreme accuracy. No slopping or dripping. Stainless steel construction—no corrosion. When ordering, specify make and type of recording instrument.
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
$6.00 each Net
Send for quantity prices
SEND FOR BULLETIN No. 115

Ten thousand dollars was tentatively earmarked for the Mrs. America contests after the domestic range division asked its promotion committee to examine the possibility of participating in the competition. The appropriation is subject to approval of the full division.

PCGA members to head for Canada in September

Preliminary plans for the Vancouver, B.C., convention of the Pacific Coast Gas Association reveal that the meeting will convene Tuesday night, Sept. 7, with a banquet. The succeeding days, Sept. 8-10, will have the usual line-up of meetings and luncheons.

On Friday, Sept. 10 the annual golf tournament will be held at the Vancouver Golf and Country Club. The manufacturers friendship hour is scheduled for Wednesday evening. Also scheduled is a boat ride to Nanaimo on Vancouver Island on Thursday afternoon. After the trip, the traditional cheese party will be held by Minneapolis-Honeywell Regulator Co.

Fred Bradley chairmans utility buyers group

Fred Bradley

Fred D. Bradley, purchasing agent and assistant treasurer of the Southern Union Gas Co., Dallas, has been elected chairman of the Public Utility Buyers' Group of the National Association of Purchasing Agents. Elections were held during the group's recent three-day convention at the Conrad Hilton hotel in Chicago.

As chairman of the buyers' group, Mr Bradley will preside at the 1955 mid-winter conference to be held at the Shamrock hotel in Houston. Approximately 700 persons are expected to attend.

Denver gas men boost ranges and incinerators

More than 200 dealers, plumbers, heating contractors, distributors, architects, engineers, and utility representatives gathered recently at the Albany hotel in Denver to inspect a display of 1954 automatic gas ranges and gas-fired incinerators at what the Rocky Mountain Gas Association dubbed the spring style show. Actually, it was the kick-off of the 1954 Old Stove Round-Up, and the gas-fired incinerator campaign, which was sparked by the RMGA.

The principal speaker of the evening was J. Robert Cameron, who discussed problems of trash and garbage disposal. Mr. Cameron,

DAVEY ··· TODAY'S BEST COMPRESSOR AND TOOL INVESTMENTS!

Davey Model 210 Super Chief

From the standpoint of original investment — and reduced operating costs — *you get more for your money with Daveys.*

DAVEY MULTI-PORT VALVES require less engine power and less fuel . . . never carbon or foul . . . assure constant full volume of air, keep tools operating at top efficiency. And, they're only one of many features of today's fine Davey lightweight, heavy-duty compressors in 60-125-160-210-315-500-600 c.f.m. sizes.

DAVEY AIR TOOLS are designed to meet today's needs! They're streamlined . . . perfectly balanced . . . easier to handle . . . hard-hitting with extra high penetrating power. And, because they offer maximum parts interchangeability, they greatly reduce maintenance and repair expense.

For complete details, see your nearest Davey distributor!

Davey Backfill Tampers, 35 and 45 lb. sizes

Davey Rock Drills, 4 sizes 28 to 58 lbs.

Davey Paving Breakers 4 sizes—35 to 90 lbs.

A-9254

DAVEY pioneers of "air-cooled air"

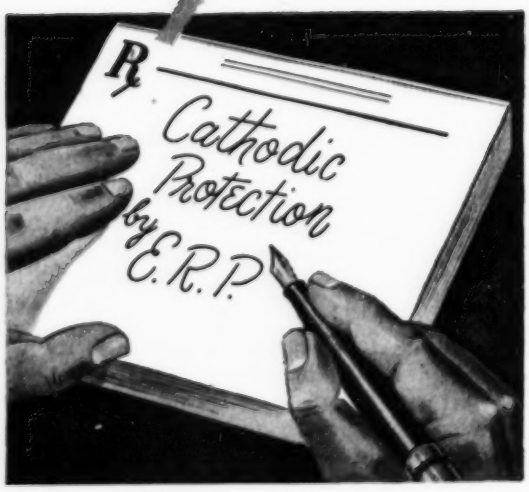
DAVEY COMPRESSOR CO.
KENT, OHIO

who is director of environmental sanitation for the city and county of Denver, stated that if some method of disposal at the source of origin could be utilized generally, it would relieve the city of the tremendous expense of picking up and disposing of refuse. One method is through widespread use of gas incinerators. He stated that properly constructed, installed, and operated gas incinerators could get rid of this refuse on the premises of the citizens without aggravating the smoke abatement problem.

The Round-Up was introduced by AGA members of the Public Service Co. of Colorado and the assistant to the publisher of the "Denver Post" explained how his newspaper planned to assist in developing a better customer acceptance of automatic gas ranges and incinerators.

Sixteen RGMA members displayed leading incinerators and ranges at the style show held recently in Denver to inaugurate the 1954 Old Stove Round-Up and gas incinerator campaign.

Rx FOR CORROSION...



You don't need a specialist to *recognize* Corrosion. But you do need one to treat it successfully. The skill required to achieve complete corrosion control comes only from the knowledge and experience gained through years of practical application.

Recognition of that fact is one reason more and more people are turning to E.R.P. for assistance on corrosion problems — one reason that thousands of buried or submerged steel structures of all types have been successfully protected against corrosion by E.R.P. engineers. Corrosion specialists *for over 17 years*, these men are highly trained and well equipped to help you with *your* corrosion problem. Write for full information today.

COMPLETE CATHODIC PROTECTION SERVICE • DESIGN ENGINEERING MAINTENANCE INSTALLATION EQUIPMENT

ELECTRO RUST-PROOFING CORP. (N. J.)
BELLEVILLE 9, NEW JERSEY
REPRESENTED IN PRINCIPAL CITIES IN THE UNITED STATES

E-27

Commercial gas school has big turn-out

Ninety-six students attended the recent AGA commercial gas school at the Hotel Morrison in Chicago to hear men from both utilities and equipment manufacturers discuss practically every phase of commercial gas application.

Lectures, demonstrations, and detailed descriptions of how the many pieces of equipment operate were presented. A majority of the lecturers used slides to augment their discussions. Question-and-answer periods followed each lecture. To relieve the tedium of continuous lectures, the program was arranged to give a varied coverage of commercial sales subjects. One day was devoted to visiting the National Restaurant Show.

Public unaware of utility regulation, PUAA told

The public knows very little about how utilities are regulated. When Consolidated Edison of New York conducted a survey among its customers, the company found that 65% of its customers did not know that prices were fixed or regulated by any government agency.

Charles B. Delafield, ConEd vice president, revealed this to delegates to the recent 33rd annual convention of the Public Utilities Advertising Association when he said: "There was a clearly marked trend that people gather a measure of reassurance from their knowledge of regulation. Of some 11% who knew we were regulated by the public service commission, 82% favored private ownership. Of the people who didn't know there was any kind of regulation, only 45% favored private ownership."

". . . How can we get the people to under-

stand that they get better and cheaper utility service if we are allowed to earn a fair and reasonable return—a little on the generous side?" he asked.

"At times we will have to tell the public things they don't want to hear. Then our public relations suffer, but to this extent public relations are expendable . . ."

John J. Quinn, vice president of Boston Consolidated Gas Co., told the more than 300 attendants that the public utilities and their advertising were singled out by Fairfax Cone, of Foote, Cone & Belding, as representing the best in advertising, in contrast to the present rash of poor taste.

Mr. Quinn believes that gas companies have reached the point where the story of a regulated industry's progress, difficulties, and requirements is no longer the sole property of top management because the companies have adopted a frank and open approach with the press, "building up reservoirs of good will that pay handsome dividends."

The director of research and planning for the National Broadcasting Co., H. M. Beville, Jr., told the utility advertising men that "color (television) is going to present public utilities with unsurpassed new advertising and public relations opportunities . . . It is conceivable that color television could bring the end of 'white goods' . . . the present tentative steps toward tinted ranges and refrigerators could receive vigorous stimulation."

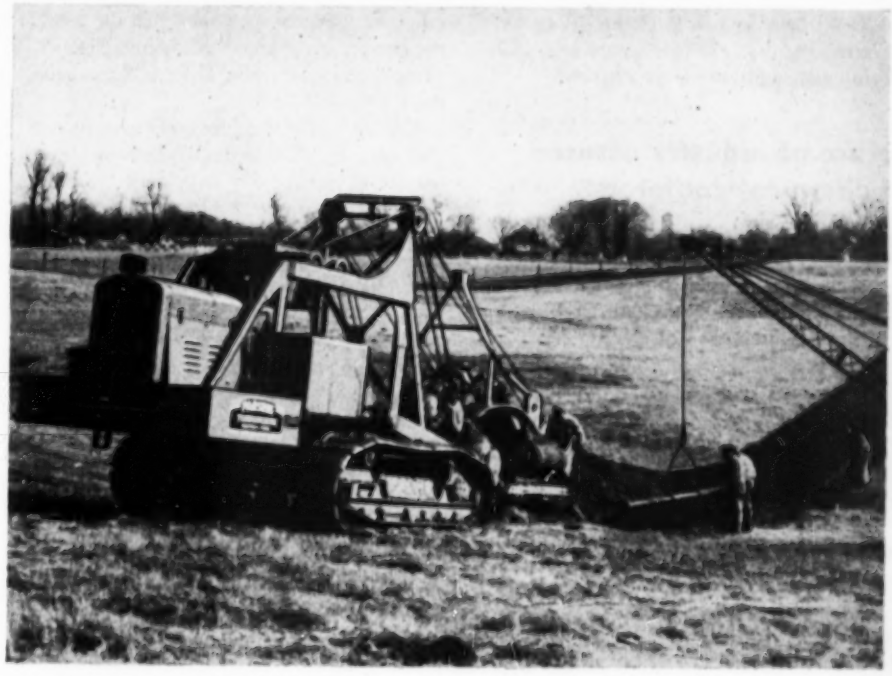
C. Fred Westin, assistant advertising director of Public Service Electric & Gas Co., Newark, was elected president of the PUAA, succeeding Walter G. Heren of Union Electric Co., St. Louis.

More than 700 expected at Appalachian short course

The 14th annual Appalachian gas measurement short course will be held at West Virginia University, Morgantown, on Aug. 23-25. The short course, only one of its kind east of the Mississippi, is attended annually by measurement and control engineers and other technical personnel representing the petroleum, gas and chemical industries. Attendance is expected to reach about 750 this year as compared with slightly more than 600 last year.

Subjects to be covered will include fundamentals of gas measurement and special sessions on domestic meters, large capacity meters, orifice meters, auxiliary measurement instruments, automatic control instruments, planning and design of installations, and pressure regulators, motor valves and related equipment.

Committee chairmen for the event are C. G. Moorhead, Hope Natural, general chairman; A. M. Hutchinson, Ohio Fuel Gas, program; J. W. Chrisman, East Ohio Gas, practical methods; Walter L. Avis, West Virginia Gas, education; Earl A. Mowrey, Rockwell Manufacturing Co., publicity;



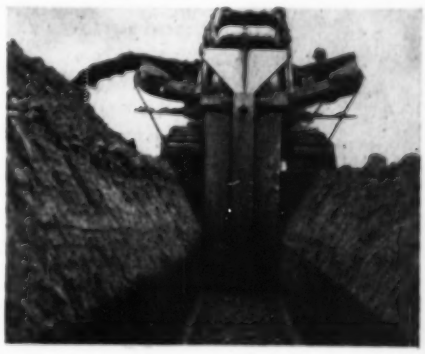
Opens trenches at rate of 17½ feet per minute...

Parsons 202 wheel-type Trenchliner sets a fast pipeline pace on transmission lines between cities, and on distribution and service lines in town. Check its wide range of digging feeds, widths and depths:

30 digging feeds, up to 17½ feet per minute, assure maximum trench production at every depth, width, and in all soil conditions. There are 15 cutting widths from 13 to 31 inches. Maximum digging depth is 6 feet. Heavy-duty digging wheel is equipped with either square or round-bottom buckets. Quick-change bucket fronts have cutting lips, or "Tap-In" teeth to suit wet or dry digging conditions. Hinged crumber sweeps trench bottom clean, ready for pipe.

Specified grades are easy to maintain because digging wheel responds instantly to sensitive friction-clutch control. Dual-purpose clutch drives the digging wheel, and acts as automatic safety throw-out to protect against shock loads. Shiftable, reversible belt conveyor discharges spoil to either side of machine.

For complete details on this heavy-duty 202 Trenchliner, contact your Parsons distributor, or write to us.



Here is another Parsons wheel-type Trenchliner . . . Model 215 for cross-country work. Digs up to 18 feet per minute. It has standard tractor crawlers with 18-inch treads, lug-type shoes.

mail to: PARSONS CO., Newton, Iowa For literature on wheel-type Trenchliners: ☐ 202 ☐ 215

NAME ..... TITLE .....

COMPANY ..... DIV. .....

STREET .....

CITY ..... STATE .....

Also interested in: ☐ ladder-type Trenchliners . . . ☐ rubber-tired Trenchmobile®

P467G

PARSONS TRENCHLINERS®

(Kaehring Subsidiary)

and R. W. Laird and R. E. Hanna Jr. of the university faculty, exhibits committee and housing and registration, respectively.

Future of industry assured at chemical conference

Fears that any problems seriously threaten the future of the gas industry were dissipated at the chemical, engineering and manufactured gas production conference sponsored by the operating section of the AGA at the William Penn hotel in Pittsburgh recently.

F. J. Pfluke, Rochester (N.Y.) Gas & Electric Corp., chairman of the operating section, stressed the importance of the role the section is playing in gas industry affairs, particularly under the GID program and the PAR plan.

Karl B. Nagler, Peoples Gas Light & Coke Co., Chicago, told of the advances made in the art of distribution and emphasized the need for more profitable "valley" loads. Enormous sendouts without profit fail to help either the utility or the investor, he said. Unorthodox thinking might help solve some of the problems.

Papers on testing for corrosion, gas odor testing, and production of natural gas substitutes were presented by Frank E. Costanzo, Manufacturers Light; Ralph L. Coryell, Con-

YOU NEED

PROTECTO WRAP...

FOR THE FAST, EASY AND ECONOMICAL COATING OF FIELD JOINTS, GAS SERVICE FITTINGS AND MECHANICAL COUPLINGS

PROTECTO WRAP is a hot applied protective coating in roll form for field joints on mill or yardcoated pipe, fittings, couplings and other metal surfaces exposed to above and below ground corrosion.

PROTECTO WRAP consists of a plasticized coal tar or asphalt enamel, of the types used for pipeline coating, saturated into a glass fabric that acts as a carrier and reinforcement for the enamel. PROTECTO WRAP is interwoven with a paper separator that insures even distribution of the coating as well as easy unwinding, regardless of temperature. The material is used to coat mteal surfaces where the quality of hot applied reinforced bituminous coating is desired.

PROTECTO WRAP is available in 2, 4 and 6 inch widths, fifty feet in length; and in 18 and 24 inch widths, 30 feet in length.

Our sales representatives are available to demonstrate this material and method. Address your orders or inquiries to our nearest sales office or to P. O. Box 82, Englewood, Colorado.

1406 JEFFERSON AVENUE, HOUSTON, TEXAS
212 PRUDENTIAL BUILDING, PASADENA, CALIFORNIA
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P. O. BOX 33, KENILWORTH, NEW JERSEY
ROOM 800, 20 E. JACKSON BLVD., CHICAGO, ILLINOIS

PROTECTO WRAP COMPANY
ENGLEWOOD, COLORADO

CALENDAR

July

6-9..American Home Economics Association—San Francisco.
15..SGA Radio Communications for Pipelines Conference — Adolphus Hotel, Dallas.
30..SGA General Accounting Conference — Read House, Chattanooga, Tenn.

August

13..SGA Pipeline Operations and Pipeline Engineering Conferences — Rice Hotel, Houston.
20..SGA Natural Gas Gathering and Natural Gas Processing Conferences — Capt. Shreve Hotel, Shreveport, La.
23-25..Appalachian Gas Measurement Short Course — West Virginia University, Morgantown, W. Va.

September

8..NEGA Joint Customer Service Managers Group and Manufacturer - Distributor Division — Wachusett Country Club, West Boylston, Mass.
8-10..31st Mid-West Gas School and Conference, Iowa State College — Hotel Sheldon-Munn, Ames, Iowa.
8-10..Pacific Coast Gas Assn. — Vancouver, British Columbia.
10..New Jersey Gas Association —Hotel Monmouth, Spring Lake, N. J.
10..SGA Compressor Station Operation Conference — Jung Hotel, New Orleans.
13..SGA Distribution Operating Conference — Henry Grady Hotel, Atlanta, Ga.
13-14..Independent Natural Gas Association of America Annual Meeting — Roosevelt Hotel, New Orleans.
15-17..AGA Accident Prevention Convention — Bond Hotel, Hartford, Conn.
17..NEGA Industrial Division — Wachusett Country Club, West Boylston, Mass.
17..SGA Distribution Operating Conference — Rice Hotel, Houston.
17-18..Maryland Utilities Assn., Fall Conference — Virginia Beach, Va.
24..Oklahoma Utilities Association Gas Division Meeting —Biltmore Hotel, Oklahoma City.
28-29..Texas Mid-Continent Oil & Gas Assn. — Baker Hotel, Dallas.
30..SGA Transmission Management Conference — Shamrock Hotel, Houston.

October

7-8..California Natural Gasoline Assn. Annual Fall Meeting. Ambassador Hotel, Los Angeles.

10-13..Controllers Institute of America—Edgewater Beach Hotel, Chicago.
11-13..AGA Annual Convention — Atlantic City, N. J.
18-22..National Safety Council — Chicago.
27..NEGA Operating Division — Hotel Statler, Hartford, Conn.

November

1-5..National Metal Exposition—Chicago, Ill.
8-11..American Petroleum Institute—Conrad Hilton Hotel, Chicago.
15-17..American Standards Association—Hotel Roosevelt, New York.
17..NEGA Safety Conference — Hotel Statler, Boston.
17-19..Southeastern Gas Association —Sir Walter Hotel, Raleigh, N. C.
17-19..Wisconsin Utilities Association, Electric & Gas Section, Technical & Sales & Service Divisions — Hotel Schroeder, Milwaukee.
28-3..American Society of Mechanical Engineers—Statler Hotel, New York.

December

7..NEGA Appliance Servicing Conference — Hotel Statler, Boston.

1955

January

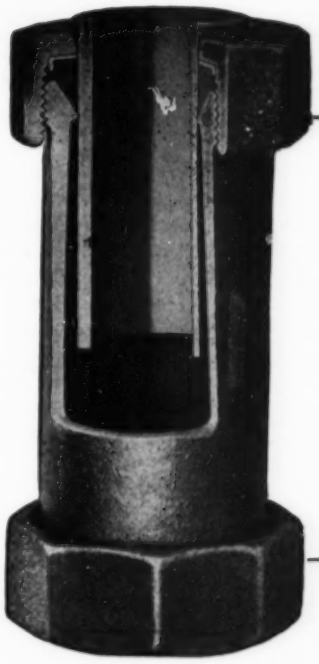
18..NEGA Operating Division—Hotel Statler, Boston.

March

7-9..Mid-West Gas Association—St. Paul Hotel, St. Paul, Minn.
7-11..National Association of Corrosion Engineers — Palmer House, Chicago.
24-25..AGA Gas Supply, Transmission & Storage Conference—William Penn Hotel, Pittsburgh.
24-25..NEGA Annual Meeting — Hotel Statler, Boston.
24-25..Oklahoma Utilities Association Convention — Mayo Hotel, Tulsa.

April

12-14..AGA Sales Conference on Industrial & Commercial Gas —Hotel Statler, Boston.
12-15..AGA Distribution, Motor Vehicles & Corrosion Conference — Netherland Plaza, Cincinnati.
19-21..Southwestern Gas Measurement Short Course—University of Oklahoma, Norman.
25-27..Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.
25-27..National Conference of Electric & Gas Utility Accountants—Conrad Hilton Hotel, Chicago.



NORMAC

Couplings, Sleeves and Fittings

for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

Compression-End Service "Tee"—First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.

Compression-End Service "Ell" — Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

Compression-End Iron Body Brass Core Service Stopcocks—End the necessity of threading on the job plus the elimination of the threads themselves—combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

Normac Brass Fittings Developed in 1939 for Use with Copper Tubing—Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE - - - CHICAGO 3, ILLINOIS

Couplings • Motor Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

solidated Edison of New York; and an IGT group headed by H. R. Linden and E. S. Pettyjohn.

Research was the major topic of one session when T. L. Robey, coordinator of research for the AGA, briefly highlighted the PAR-sponsored research program. The 400 delegates were briefed on 54 projects now under way at the AGA labs, the Institute of Gas Technology, and other research institutions.

Association notes

Roy E. Jones, executive vice president of the Peoples Water & Gas Co., North Miami, Fla., is the recently elected president of the Florida-Georgia Gas Association. He was elected at a two-day business meeting of the association in Peoples' North Miami headquarters. Joseph Frink, of Florida Power & Light Co., was elected secretary-treasurer.

Applications are being considered for five major gas industry awards, honoring individuals and companies, to be presented by the AGA at its annual convention in Atlantic City, Oct. 11-13. The five awards are the Distinguished Service award, the Distribution Achievement award, the Beal Medal, the Meritorious award, and the Home Service Achievement award. Further information is available from AGA headquarters, 420 Lexington Ave., New York 17.

A TRIPLE THREAT

to your operating efficiency

Unless this rampaging menace is stopped short of the goal, your engines, your equipment and your entire processing system will remain vulnerable to its attacks.

H_2S can be stopped — dead in its tracks — by America's most effective, most economical, **most proven** gas purification method known today — Connelly IRON SPONGE! Yes, this simple, high-capacity product can be depended upon to cleanse any flow—at high or low pressure—of hazardous Hydrogen Sulphide . . . and also to lower operating and maintenance costs. IRON SPONGE renders this service prolongingly — subject to easy rejuvenation.

Despite its thoroughness and over-all superiority, Connelly IRON SPONGE spreads its low cost thin through each 1000 feet of gas. To get the full facts about this effective purifier, write, wire or phone Connelly — today. Our engineering department is at your service.

Connelly IRON SPONGE

PRODUCT OF

CONNELLY, Inc.

3154 S. California Ave., Chicago 8, Illinois
Elizabeth, N. J. • Los Angeles, Calif.

People

Promotions

CLAUDE H. WEBBER, who has been with the company for more than 30 years, has been elected vice president in charge of gas operations of the Tucson (Ariz.) Gas, Electric Light & Power Co. He was formerly superintendent of the gas department.

C. H. Webber
Tucson Gas

E. F. Schmidt
Lone Star

ELMER F. SCHMIDT, senior vice president of Lone Star Gas Co., Dallas, and its wholly owned subsidiary, Lone Star Producing Co., retired last month, bringing to a close a lengthy career in the public utilities field, 36 years of which were spent with Lone Star. He will open a consulting office in Dallas. Mr. Schmidt served Lone Star as gas measurement superintendent, chief engineer, general superintendent, vice president in charge of production and transmission, and as a member of the board of directors.

DEAN K. SEIZERT, industrial sales engineer in Toledo, has been named industrial and commercial sales manager in the Toledo district of the Ohio Fuel Gas Co.

ROBERT E. DESHON has been promoted to assistant manager of Republic Supply Co.'s northern division in San Leandro, Calif.

WILLIAM H. SHENKLE, a gas products engineer with the Rockwell Manufacturing Co.'s instrument division at Tulsa, Okla., has been named chief engineer of the division.

ROBERT N. GRAHAM, vice president for operations, and WILLIAM F. REICH JR., also a vice president, have been named executive vice presidents of Carbide & Carbon Chemicals Co., New York. Newly appointed vice presidents are N. C. BABCOCK, E. E. FOGLE, and H. D. KINSEY.

A. BRUCE EWING, formerly with Ford Motor Co., has been named news bureau manager in the information department of the Manufacturers Light & Heat Co. and other Pittsburgh group companies of the Columbia Gas System.

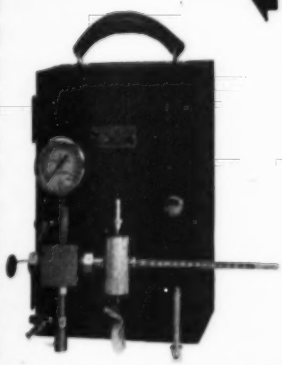
CHARLES PENNYPACKER SMITH has been promoted to the newly created position of senior gas supply and meteorological engineer of the Pacific Gas & Electric Co., San

DEW POINT TESTER AND RECORDER

BUREAU OF MINES TYPE

for testing gases under pressure.

Records dew point of gases under pressure.



- **PRECISION DETERMINATIONS:** Bureau of mines tests show that with manipulation dew points can be duplicated to within 0.2°F.
- **ACCURACY:** Averaging test measurements, the Bureau of Mines reported less than 0.2°F. Dew point temperature difference compared to known standards.
- **SAFETY:** Hydrostatic tests show a maximum working pressure of 3,000 psi. Adjustable mirror allows for safe visual observation into the pressure body.
- **SUITABILITY:** For use with gases under pressure; at pressures from atmospheric to 3,000 psi.
- **CONTINUOUS RECORD:** of dew point gas
- **RAPID RESPONSE:** To changing dew point of gas
- **RELIABLE RESULTS:** Obtained to allow for the control of dew point of natural gas in long distance high-pressure transmission lines.

This instrument records dew point of a continuous sample of natural gas at line pressure up to 1,500 psi.

cenco

Cenco . . . one dependable source of supply for everything you need in scientific instruments and laboratory supplies. Over 15,000 items . . . 14 branch offices and warehouses.

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REFINERY SUPPLY COMPANY

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2215 McKINNEY AVENUE ● HOUSTON 3, TEXAS

CENTRAL SCIENTIFIC COMPANY

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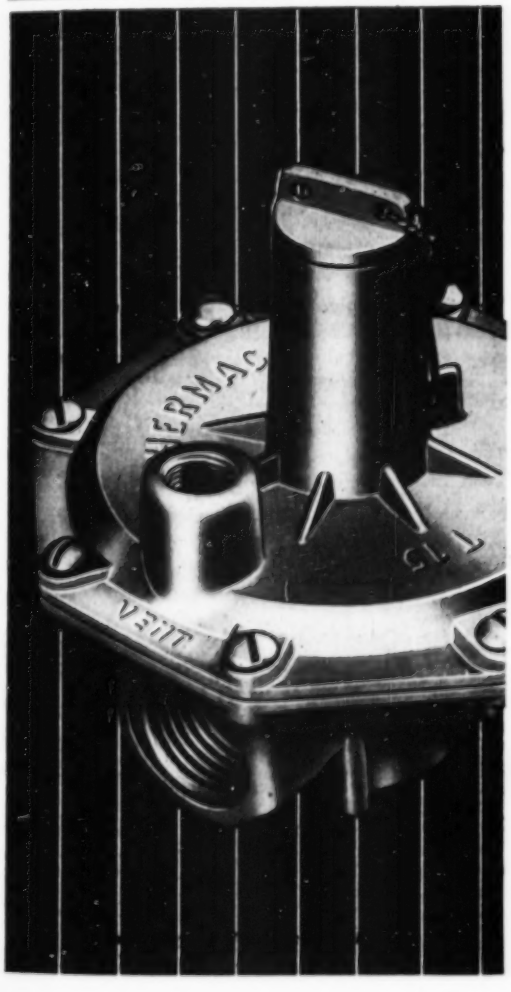
CHICAGO NEWARK BOSTON WASHINGTON DETROIT SAN FRANCISCO

SANTA CLARA LOS ANGELES TORONTO MONTREAL VANCOUVER OTTAWA



WHY IT PAYS TO SPECIFY THERMAC

GAS APPLIANCE REGULATORS

SMALL SIZE — LARGER CAPACITY is the chief reason for the unprecedented demand for Thermac pressure regulators.

EASY TO SERVICE. Few rugged parts easily accessible without removing regulator from line.

DEPENDABLE, CONSISTENT PERFORMANCE. Constant pressure regulation eliminates pilot light failures due to fluctuating pressures and assures proper operation of automatic controls.

NATIONALLY ACCEPTED by all utility companies for servicing. Standard equipment with many leading gas appliance manufacturers.

$$$

LOW COST. High production methods represent a saving of great importance to the appliance builder and user.

THERMAC

HM COMPANY

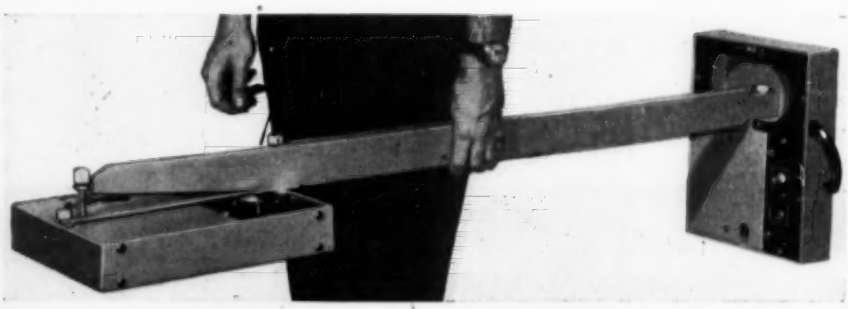
800 EAST 108TH ST LOS ANGELES 59, CALIFORNIA

THERMAC GAS SHUT-OFF VALVE—Aluminum Alloy

This high capacity, low restriction manual main gas shut-off valve, when used with Thermac regulators, provides an unusually low cost assembly.

THE WILKINSON LINE LOCATOR

A precision instrument for detecting the position and depth of any sub surface pipe, cable, valve, etc.



The dependability of the Wilkinson Line Locator is amply attested by its wide use. Leading gas, oil and pipe line companies generally KNOW its value.

WILKINSON PRODUCTS COMPANY

3987 Chevy Chase Drive • Pasadena 3, California • SYlvan 0-4314

HELPS STOP GAS LEAKAGE

Easily Operated by One Man. Operates With Up and Down Motion.

PATENT PENDING

We can help your company save in gas leakage and help prevent gas line breakage, by using our Safety Gas and Liquid Line Probe. Other gas companies using our Gas Probe are getting results in cutting down the loss of leakage, and help detect the big loss of a breakage before it occurs. Other companies use them—why not prove to your company that probing pays the easy way?

PRICE $7.50 F.O.B.

Lake City, Ia. Subject to change in price.

Frank's Machine Works

Manufacturers of

New Safety Gas & Line Probe

Lake City, Iowa

THERE'S NO SEAL LIKE RECTORSEAL

— that's why gas companies are switching to this positive, economical, leak-proof thread sealing compound.

If you haven't tried Rectorseal, get a can from your supply house today. Check its sealing quality, consistency, cleanliness, insolubility, smoothness, economy, and other advantages with thread seals you are now using.

Rectorseal holds even the most potent odorants. It never hardens, crumbles, cracks or gets brittle.

If your supply house can't supply you, send us his name and address and we will send YOU a generous FREE SAMPLE.

RECTORSEAL, Dept. "B"
2215 Commerce St. Houston 2, Texas

RECTORSEAL # 2
MAKING THE GAS INDUSTRY SAFER

Francisco. JESSE C. MOSS succeeds him as chief gas dispatcher. DUNLAP D. SMALLEY, who retired recently as vice president and assistant general manager of PG&E, has become vice president and operating manager of the Southern Nevada Power Co., Las Vegas.

HENRY A. EDDINS, vice president in charge of operations, has been elected executive vice president in charge of operations of the Laclede Gas Co., St. Louis. At the same time, ALLEN H. BURGES, general superintendent, was elected a vice president.

J. PAUL JONES has joined the Whirlpool Corp., St. Joseph, Mich., as director of engineering research and development.

ERNEST S. KOPECKI has joined the Selas Corp. of America, Philadelphia, as manager of public relations and promotion.

DR. JUDSON L. ANDERSON, geologist specializing in gas and oil reserves estimates, has joined the Columbia Gas System as an assistant to Irving K. Peck, vice president. His headquarters will be in the Columbia Gas System Service Corp. office in Houston.

P. A. RAY, chief engineer since 1950 has been elected vice president and chief engineer of United Cities Utilities Co., Chicago. The company has also announced the election of DENNIE E. FREEMAN as assistant treasurer.

DR. HARRY L. PURDY, vice president in charge of the gas system of the B. C. Electric Railway Co., has been appointed head of the transportation of the company. He will continue in charge of the gas system.

Peoples Natural Gas Co., Pittsburgh, has announced the following changes: GEORGE C. WILLIAMS, assistant secretary; RUDY C. SUCHMA, general supervisor of tabulating machines services; JACK V. KOELSCH and JAMES JACOBS, head and assistant, respectively, of the billing department; HENRY S. YEAGER, assistant superintendent of the Clarion Field district.

WINTHROP E. MANGE and OTTO W. MANZ Jr. have been elected vice presidents of Consolidated Edison Co. of New York. Mr. Mange will have responsibilities in the field of industrial relations and Mr. Manz will have charge of testing and distribution operations.

O. W. Manz Jr. W. E. Mange
Consolidated Edison

FRED R. RAUCH, vice president of the Cincinnati Gas & Electric Co. and the United Light, Heat & Power Co. Inc., and director of industrial relations, has been elected to the board of directors. Other promotions include: MILES J. DOAN and H. GEORGE EILERS, assistant treasurers; HAROLD J. WOEHRMYER, assistant secretary. WILLIAM H. ZINNER, vice president and treasurer, was also named assistant secretary.

H. EMERSON THOMAS, of H. Emerson Thomas & Associates, has resigned as president of Pennsylvania and Southern Gas Co. and its subsidiaries. ERIC TINNEY, of Lewis C. Dick & Co., a Philadelphia investment house, was elected to the presidency. Mr. Thomas will remain a director of the companies and will serve in a consulting capacity.

E. L. HARPOLD has been promoted to supervisor of stores and ARTHUR L. WILLIAMS to assistant supervisor of stores of Lone Star Gas Co., Dallas.

FRED J. WATT has been named manager of a newly combined section of Worthington Corp.'s air conditioning and refrigeration division at Harrison, N. J.

The following men have been elected to new offices in the Minneapolis (Minn.) Gas Co.: GEORGE B. JOHNSON and KENNETH B. LUCAS from assistant vice presidents to vice presidents; E. J. BOYER to assistant vice president and sales manager; CLIFFORD E. JURGENSEN, KENNETH W. PERSON, and BERT H. ROBERTS to assistant vice presidents.

CHARLES R. WIRTH has been named district representative by Eclipse Fuel Engineering Co., Rockford, Ill., for the company's new West Coast district office, which is known as the Industrial Combustion & Furnace Co., Glendale, Calif.

GUY W. WADSWORTH JR., vice president and general manager, has been named president and general manager of Southern Counties Gas Co., Los Angeles, succeeding ARTHUR F. BRIDGE, who has withdrawn from active duty with the company after 35 years. Mr. Bridge has been president of Southern Counties since 1947. JERROLD Q. ABEL has been named controller and treasurer and has been elected to the board

G. W. Wadsworth

A. F. Bridge

Southern Counties

For Easy Pipe Threading

2½" to 4"... it's the 4P

RIDGID

RIDGID 4P is easy to carry, easy to put on pipe

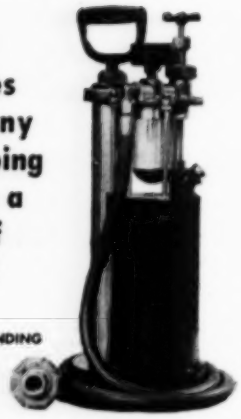
Balanced loop handles make it a cinch to carry and swing up on a pipe! Besides, the mistake-proof workholder sets to size before you lift it—only one screw to tighten on pipe. Easy upkeep—drive pinion in oilless bronze bearing; safe enclosed gear. 4 sets of 5 high-speed steel dies, 2½", 3", 3½", 4". Ratchet handle. RIDGID drive shaft available. Save work—buy 4P at your Supply House.

The Ridge Tool Company • Elyria, Ohio, U.S.A.

RIDGID
Work-Saver Pipe Tools

DRAGNET
leak detector

detects and locates leaks on any pressure piping system in a matter of minutes!

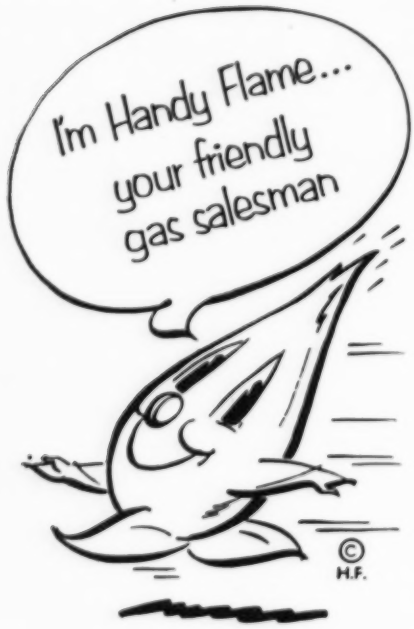


PATENTS PENDING

Here's the newest time-saver in the industry! The compact, portable Dragnet Leak Detector will detect even the tiniest leak on any pressure piping system for gas, steam, water or refrigeration. Unique "bubble action" principle much faster than by using pressure gauge or manometer.

SEND FOR BULLETIN 545

UNIVERSAL
CONTROLS CORPORATION
731 WEST DAVIS STREET DALLAS 8, TEXAS



Put new life into your entire sales program. Put friendly Handy Flame to work in your ads, displays, direct mail, TV and radio programs, home service activities, novelties, etc. Now used by 36 gas companies. Complete utility service one-half cent per customer per year. $25 minimum. Satisfaction guaranteed. Write for details and free idea file. Handy Flame Service, P. O. Box 302, Indianapolis 6, Ind.

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COMPANY_____

NAME_____ POSITION_____

STREET CITY ZONE STATE

of directors, filling the vacancy created through the illness of GEORGE T. KELLY, former controller and treasurer.

HORACE P. LIVERSIDGE, chairman of the board of the Philadelphia Electric Co., has been elected chairman of the board of trustees of Drexel Institute of Technology. He is the first person other than a member of the Drexel family to serve as board chairman.

RALPH L. LEADBETTER, vice president has been elected president of Burgess Manning Co., Libertyville, Ill., succeeding WILLIS L. MANNING, who will remain as treasurer and a member of the board.

HOWARD L. CLARY, who has been assistant general manager of the Bryant Heater Div., AGE, and director of sales, has been elected a vice president of Affiliated Gas Equipment Inc., Cleveland. RONALD CAMPBELL, who has been assistant to the president of AGE and director of manufacturing, was also elected a vice president.

R. Campbell

H. L. Clary

Affiliated Gas

FRANKLIN F. BOGARDUS has transferred from his post as district manager of the Roots-Connersville Blower Div.'s Cleveland, Ohio, office to a similar position in its Chicago office, where he will direct sales in Wisconsin, Minnesota, Iowa, and northern Illinois. RICHARD L. TANNEHILL, field representative for Roots since 1947, succeeds him in Cleveland.

JOHN A. CLARK, chairman of the board of directors of Hope Natural Gas Co., Clarksburg, W. Va., retired recently after more than 41 years with the company. He joined Hope in 1912 as meter engineer, later serving as assistant superintendent of compressor stations, chief engineer, general superintendent and chief engineer, vice president in charge of operations, president, and chairman of the board. The company has also announced the election of J. C. CROSS, treasurer, as vice president.

WALTER S. BYRNE, who for 15 years has served as general manager of the Metropolitan Utilities District, Omaha, has retired.

Servel Inc., Evansville, Ind., has named PAUL R. KENNEDY southern regional manager, succeeding A. J. SCHULLSTROM, who has resigned. Mr. Kennedy will headquarter in Atlanta, Ga. Servel has also announced

that JOHN F. MYERS has joined the company as district sales manager for New England, covering Massachusetts, Rhode Island, Maine, and Connecticut. He succeeds JOHN S. RYAN.

J. P. Coghlan
PG & E

G. S. Chappers
Robertshaw

JOHN P. COGHLAN, vice president and assistant to the president of Pacific Gas & Electric Co., San Francisco, retired on June 30 after more than 48 years of service. He will continue as a member of the board of directors. Mr. Coghlan has served as a member of the board for 23 years, as assistant to the president for 31 years, and has been vice president for almost 26 years.

New faces

GEORGE S. CHAPPERS has joined Robertshaw-Fulton Controls Co., Greensburg, Pa., to fill the newly created post of director of advertising and public relations. He was formerly with Ketchum, MacLeod & Grove and Armco Steel Corp.

GLEN A. WHITE has joined the Bryant Heater Division as an engineer coordinator in the engineering department.

DONALD DAILY and WILLIAM H. JOHNSON have joined the sales staff of the Fielden Instrument Division of Robertshaw-Fulton Controls Co. LAWRENCE C. CONNOLLY, formerly sales engineer for the division, has been named manager of the Boston sales office.

Deaths

PAUL F. LEARY, 62, superintendent of the Portland (Ore.) Gas & Coke Co.'s customers office, collapsed and died of a heart attack June 4, while presenting Gasco bowling league trophies. A 33-year veteran, he joined the company in 1921 as an order clerk, becoming supervisor of the contract bureau in 1937 and superintendent of the entire customers office in 1947.

H. WARD CHEESEMAN, senior sales engineer of the Sprague Meter Co., Bridgeport, Conn., died recently. He was 74 years old. Mr. Cheeseman was associated with Sprague for 48 years, starting as a timekeeper in 1906 and later becoming foreman. He was one of the original 13 members of the Gild of Ancient Supplers and was a member of the AGA, and the Pennsylvania, New England and New Jersey gas associations.

H. ZINDER & ASSOCIATES, INC.

UTILITY CONSULTANTS

WASHINGTON — DALLAS

ANNOUNCE THE ASSOCIATION OF

IONEL I. GARDESCU, PET. E., PH. D.

PETROLEUM ENGINEER AND GEOLOGIST

AND THE ESTABLISHMENT OF A

GEOLOGICAL DEPARTMENT

ON JULY 1, 1954

2104 MELROSE BUILDING

HOUSTON 2, TEXAS

PHONE: ATWOOD 1461

REED TRADEMARK

Announces . . .

. . a revolutionary

New HINGED PIPE CUTTER

You can cut off 8" pipe, in

less than 5 minutes

send for free literature on these amazing cutters for standard steel and cast iron pipe from 2½" to 12".

MAIL THIS COUPON TODAY

REED MANUFACTURING CO.
ERIE, PA.

Without obligation, please send me descriptive literature on your new hinged pipe cutters.

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Company _____

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GAS CLASSIFIED

Classified advertising is set in 6-point type, without border or display, at the rate of 15 cents per word per insertion; minimum charge per insertion $3. Box numbers for replies count as 5 words. Count as a word each one letter word and each group of figures. Classified advertising is only accepted when payment accompanies order. Copy and payment must reach publisher's office prior to 10th of month preceding publication.

Clark Model MA-8, 300 BHP, 600 RPM, Midget Angle Type, Skid Mounted, Gas Engine Driven Compressor, equipped with eight - 8¼" bore x 8¼" stroke, power cylinders. Double acting C.I. compressor cylinders as follows: Two - 11" first stage, One - 7¾" second stage, and One - 4½" third stage. 814.4 p.s.i.a. max. discharge at 945,000 C.F.D./14.7# - 60° F. - Zero Suction. Maximum WP, first stage 350 p.s.i., second stage 500 p.s.i., third stage 900 p.s.i. Unit is mounted on tandem axle lowbed semi-trailer, mobile operation from trailer. Previous use, pipeline testing with approx. 3800 hours logged, 2 years old. For further details contact Algonquin Gas Transmission Company, 25, Faneuil Hall Square, Boston 9, Massachusetts.

You get low-cost results in GAS classified ads, because GAS has wider circulation than any other gas publication — 33% more total circulation and 55% more circulation in gas companies.

METERS AND REGULATORS

Changed or Service Regulators installed on an economical contract basis. Prompt and efficient service. Costly delays avoided.

Shriver Gas Service Division of
Shriver Gas Conversions, Inc.
516 W. Main St., Norristown, Pa.
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stand by or year 'round

LP-GAS PLANTS
designed • installed

H. Emerson Thomas & Associates, Inc.
P. O. BOX 270 WESTFIELD, N. J.

LP Gas Installations
and
Anhydrous Ammonia Plants
More than 80 Peacock Plants prove . . .
"There's No Substitute For Experience"
PEACOCK CORPORATION
Box 268, Westfield, N. J. Westfield 2-6258

IT'S UNITED FOR

Dependable L-P Gas supply
Assured deliveries
Engineering consulting service

UNITED PETROLEUM GAS CO.
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M-SCOPE PIPE FINDER

NEW MODEL "ELECTRONIC WITCH"
ONE MAN OPERATION
SUPERIOR OPERATION
ONLY $162.50
FREE LITERATURE

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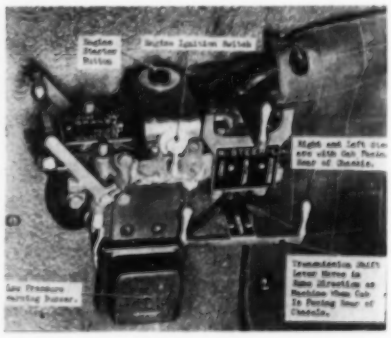
PALO ALTO, CALIFORNIA

New Products and Trade Literature

To secure further information on products or new literature, simply fill out the coupon on page 90 and mail, indicating by number the information or literature needed.



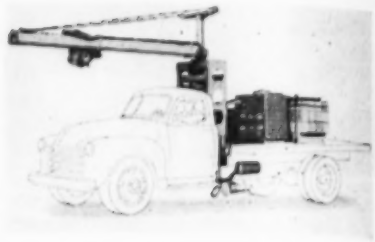
1 Remote Control

Both the Bucyrus-Erie Hydrocrane and Hydrohoe — all-hydraulic truck crane and dragshovel respectively—are now available with remote control. Designed for use where frequent short and accurate moves rather than speed are important, remote control permits simultaneous operation of the motor truck and Hydrocrane or hoe, on short moves in first or reverse gears, from the operator's station on the crane deck. Remote control also provides the advantage of power steering for accurate maneuvering in tight quarters.

Truck air brakes are included as part of the remote control "package." A low pressure air buzzer system with air signal whistle is installed in both truck and operator cabs and is connected in series. Two air storage tanks are also provided.

Bucyrus-Erie Co.

■



2 Truck Crane

A truck crane that simplifies materials handling jobs and converts any standard truck into a dual-purpose hauling and handling unit is being produced by Truck-Crane Inc. The truck-crane is hydraulic operated. All controls are grouped and accessible from either side of the truck; one hand lever reverses, locks, and operates the winch at the speed desired.

The horizontal boom will pick up and deposit loads on either side of the truck, front or rear. Optional boom lengths are available up to 16 ft. Lifting capacities are from 1000 to 5000 lb.

The elevating boom swings 280° and is available with or without telescoping boom. It has extensions up to 22 ft.

Truck-Crane Inc.

■

3 Cost Calculator

A new sales tool to help LPG dealers and appliance salesmen sell more LPG appliances against electrical appliances is available. Designed for use in selling ranges or water heaters, or a combination of these two with refrigeration, the calculator operates like a slide rule and shows quickly, in dollars per year, the comparison of what it costs to operate these appliances on LPG and on electricity, at whatever local rates may be.

Basis for the comparisons is the average annual usage of fuel as determined by the U. S. Department of Agriculture and set forth in its recently released Technical Bul-

For additional New Products and Trade Literature, turn to Page 128 in the Pipeline Section.

letin No. 1073. Families using more or less than the average would have varying annual costs, but the ratio between LPG and electricity would remain the same.

Simple enough for any schoolboy to use and any housewife to understand, the competitive cost calculator is priced at $1 to readers of GAS.

Gas Magazine

■

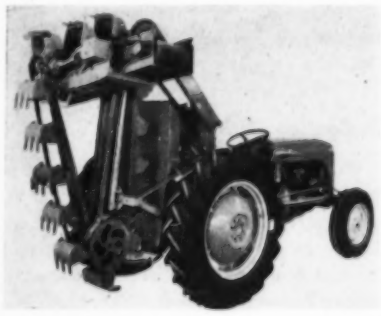
4 Pipe Coupling

A compression pipe coupling for connecting small pipe is being produced by Utility Clamp & Equipment Co. To employ the new coupling, the installer merely inserts the pipe ends into the factory assembled couplings and tightens the compression nuts.

There are only three assembly parts, the sleeve and the two compression nuts. Steel gasket retainers are die-formed and are expanded permanently into the compression nuts at the factory. The gaskets, either rubber or neoprene, are inserted in the retainers and are quickly replaced if necessary. The retainers allow the nuts to screw up easily on the sleeve and compass the gaskets without friction or seizure. Regular couplings have sleeve lengths from 2¾ in. to 4 in., increasing in size ¼ in. for each larger pipe diameter. Sleeves may be had in a choice of materials.

Utility Clamp & Equipment Co.

■



5 Trencher

Design improvements in the 1954 Everett trencher, manufactured by Earth Equipment Corp., include a built-in rock guard, single-wheel design for faster penetration, new V-belt power drives, and easily accessible controls.

The trencher cuts up to 42 in. deep in a width of 12 to 18 in. Operating from the power take-off of the tractor, the unit is raised and lowered by a built-in hydraulic system. A V-belt safety slip feature is built into the drive of the trencher to stop the bucket line when obstructions such as pipe-

Natural Gas Standby

A typical Draketown Propane Plant for augmentation and standby

Whether your load is large or small, you will find a Draketown design to meet your specific requirements. Ready at the turn of a valve—completely automatic if you wish—accurate and dependable—your Draketown Plant keeps that pressure up when things get rough.

DRAKETOWN®

PROPANE PLANTS

" Good Gas Insurance "

If you have a gas problem, we can help you. We operate from coast to coast and overseas. **Phone or write today—no obligation!**

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WARRENGAS
A LIQUEFIED PETROLEUM GAS OF HIGHEST QUALITY

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NEW YORK, NEW YORK
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WORLD'S BEST
SMALL
TRENCHER

LOWEST COST TRENCHING FOR PUBLIC UTILITY WORK

Manufactured Under Patents Pending

Digs 3" to 6" Trenches Any Depth to 36"

For low-cost general light trenching. Self-contained, operates under its own power. Digs clean, even trenches to 36" depth. Lightweight, mobile, low operating and maintenance costs. Easily transported from job to job. Several models.

PROVEN IN ALL SOILS

DITCH-WITCH TRENCHERS pay for themselves in a few days.

Write for Illustrated Literature

THE CHARLES MACHINE WORKS
626 B STREET • PERRY, OKLAHOMA

HOSPITALITY AT ITS BEST IN HOUSTON

One thousand air-conditioned rooms . . . four great restaurants . . . 1,000-car garage . . . ideal entertainment and convention facilities. Rates from $4.50 single and $6.50 double.

B. F. ORR, *Management*

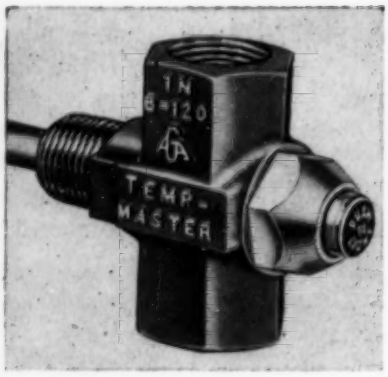
RICE HOTEL
HOUSTON, TEXAS

Home of the fabulous Petroleum Club

line, heavy roots, large rocks, and foundations are encountered.

Earth Equipment Corp.

■



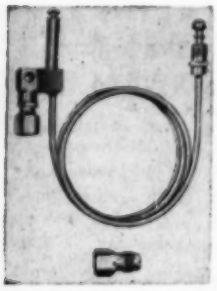
6 Gas Shutoff

Titan Valve & Manufacturing Co. has introduced a new vital high temperature gas shutoff of the rod and tube type that acts to interrupt the main gas supply when the temperature exceeds a predetermined limit. The gas supply remains off until the trouble is corrected and the valve is reset manually. The AGA-approved valve meets requirements of the FHA and VA.

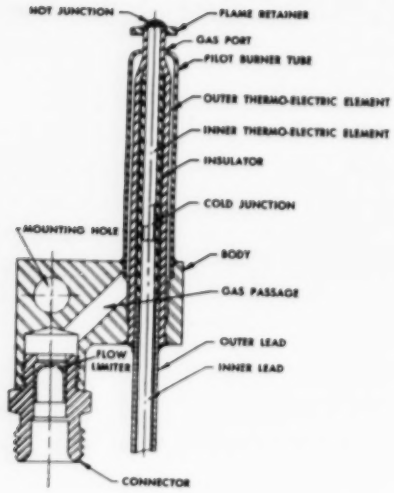
Titan Valve & Manufacturing Co.

■

7 Pilot Burner-Thermocouple



A simplified approach to the problem of automatic ignition for gas ovens, laundry dryers, water heaters, and wall heaters has been developed by Robertshaw - Fulton. Called the Mini-Pilot, the new control consists of a combination pilot burner and thermocouple in one compact unit. Low gas input insures gas ranges a cool standby operation that will not affect room temperature. Low gas consumption is also claimed.



Because it is non-aerated, the tiny pilot cannot become clogged with lint. An encircling blue flame on the pilot head provides a constant source of heat to the built-in thermocouple, which is available in all standard lengths.

The Mini-Pilot will handle all gases without any change in the orifice.

Robertshaw-Fulton Controls Co.

■

Trade Literature

8 Relief Valve Pamphlet

A new catalog (two-color, 20 pages) describing process control instruments is now available from Fischer & Porter Co.. Listed is a variety of flow meters, recorders, controllers, pressure regulators, sight flow indicators, and chemical feeders. Complete instrument specifications are clearly set forth. Sizing nomographs for the two most common types of Flowrator meters are also given covering both liquid and gas service.

Fischer & Porter Co.

■

9 Valve Reference Book

A 24-page reference book, No. 39-5, shows Homestead lubricated plug valves in full-port and venturi types, sizes up to 14 in., and with a choice of self-sealed, two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants, etc.

Homestead Valve Manufacturing Co.

■

10 Specification Sheet

Bowser Inc. has published a specification sheet covering the Incinor, the company's gas-fired automatic incinerator.

Bowser Inc.

■

11 Servicing Catalog

E. F. Griffiths Co. has issued a new supplement to its regular catalog of appliance servicing materials, special tools, and conversion parts for the gas industries. Testing thermometers, flaring, bending and cutoff tools for tubing, the new G-4018 thermostat adjusting tool, a complete line of M/W cylinder trucks, the Yeats appliance dolly, special channelock pliers, drill gauge plates, and many other servicing items are listed among these additions to the Griffiths line.

E. F. Griffiths Co.

■

12 Billing Brochure

How the public utility billing operation for 1 million customers can be reduced from the nearly four-day cycle required under conventional punched card procedures to only a little more than two days through the use of IBM's new Type 650 machine is described in the company's brochure, "Public Utility Customer Accounting." The way in which the 650 performs in one pass all the bill computing and the analysis of this revenue is illustrated by a large-scale comparative flow chart, which supplements the text.

International Business Machines Corp.

■

13 Coating Catalog

Vulcan Rubber Products' new comprehensive catalog lists a simple graphic form the wide range of sizes, weights and other specifications of Buna-N coatings, Neoprene coatings, Premier coatings, natural rubber coatings, and molded diaphragms, in addition to many special purpose fabrics made by the company.

Vulcan Rubber Products

■

14 Heat Control Brochure

A new four-page color brochure from General Controls describes recent developments and refinements in the company's B-60 heat control system. The brochure illustrates the latest BC snap-action and mercury switch thermostats, in gas control valves, and in pilot generators.

General Controls Co.

Mail this Coupon for **NEW PRODUCTS INFORMATION**

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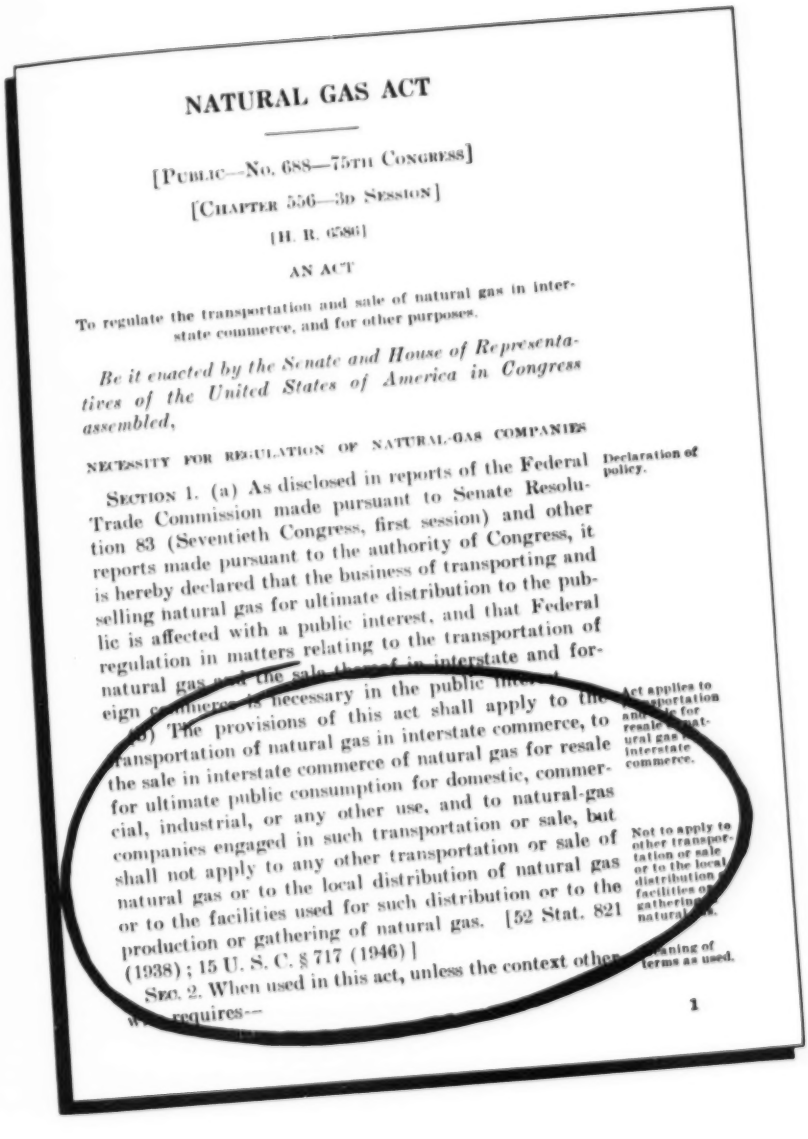
GAS Transmission and Conditioning Section



NATURAL GAS ACT

[PUBLIC—No. 688—75TH CONGRESS]

[CHAPTER 556—3D SESSION]

[H. R. 6586]

AN ACT

To regulate the transportation and sale of natural gas in interstate commerce, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

NECESSITY FOR REGULATION OF NATURAL-GAS COMPANIES

Declaration of policy.

SECTION 1. (a) As disclosed in reports of the Federal Trade Commission made pursuant to Senate Resolution 83 (Seventieth Congress, first session) and other reports made pursuant to the authority of Congress, it is hereby declared that the business of transporting and selling natural gas for ultimate distribution to the public is affected with a public interest, and that Federal regulation in matters relating to the transportation of natural gas and the sale thereof in interstate and foreign commerce is necessary in the public interest.

Act applies to transportation and sale for resale of natural gas in interstate commerce.

(b) The provisions of this act shall apply to the transportation of natural gas in interstate commerce, to the sale in interstate commerce of natural gas for resale for ultimate public consumption for domestic, commercial, industrial, or any other use, and to natural-gas companies engaged in such transportation or sale, but shall not apply to any other transportation or sale of natural gas or to the local distribution of natural gas or to the facilities used for such distribution or to the production or gathering of natural gas. [52 Stat. 821 (1938); 15 U. S. C. § 717 (1946)]

Not to apply to other transportation or sale or to the local distribution facilities or gathering of natural gas.

Meaning of terms as used.

SEC. 2. When used in this act, unless the context otherwise requires—

1

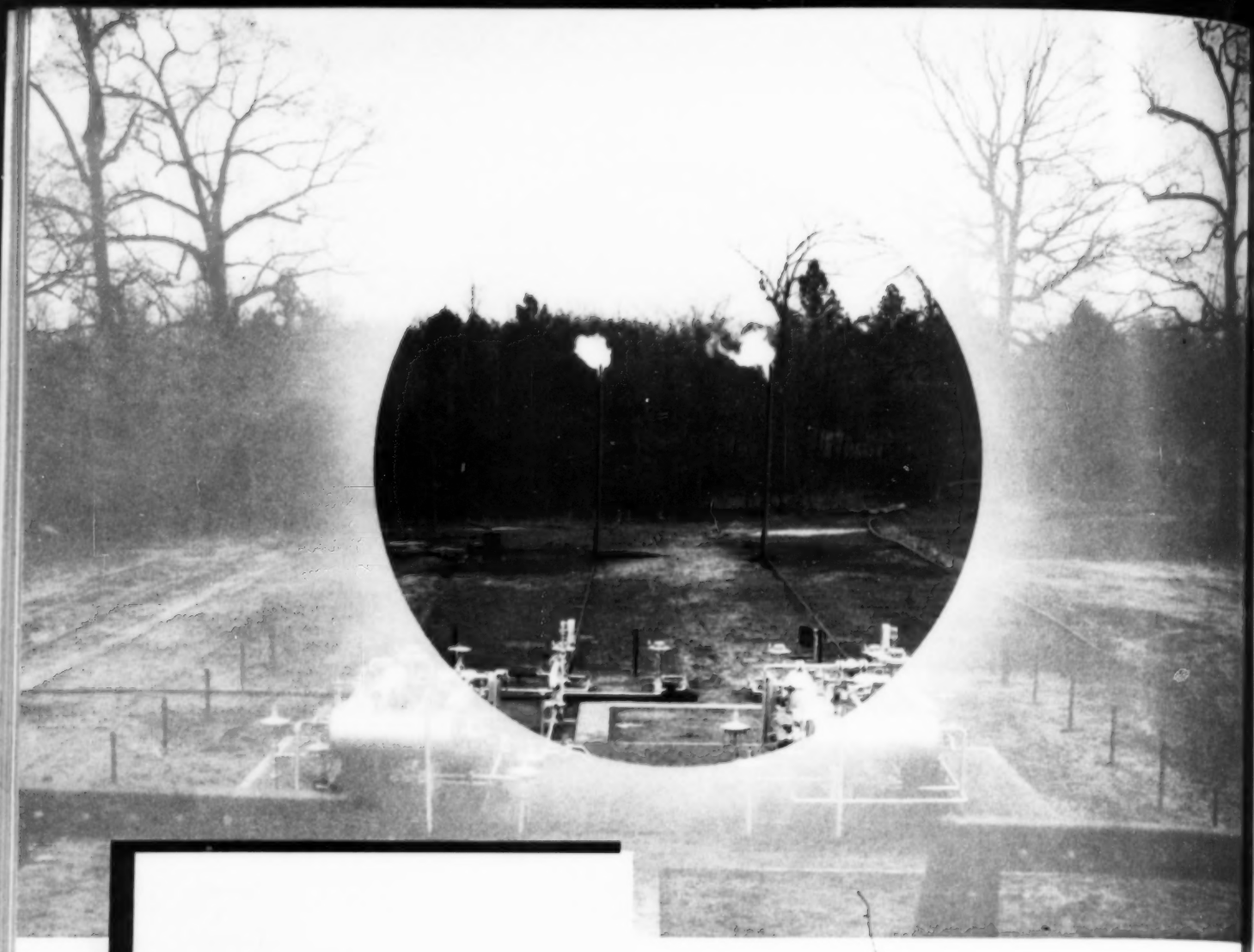
FPC has jurisdiction over independents

THE Supreme Court of the United States on June 7 ruled in a 5-to-3 decision that the Federal Power Commission has jurisdiction "over the rates of all wholesales of natural gas in interstate commerce, whether by a pipeline company or not and whether occurring before, during, or after transmission by an interstate pipeline company."

The court's decision, which affirmed the decision of the United States Court of Appeals for the District of Columbia in the Phillips Petroleum Co. case holding that Phillips was subject to FPC jurisdiction as a natural gas company, was characterized in a dissenting opinion by Justices Clark and Burton as so sweeping that "on its face, this language brings every gas operator, from the smallest producer to the largest pipeline, under federal regulatory control."

The majority opinion stated that "Regulation of the sales in interstate commerce for resale made by a so-called independent natural gas producer is not essentially different from regulation of such sales when made by an affiliate of an interstate pipeline company. In both cases, the rates charged may have a direct and substantial effect on the price paid by the ultimate consumers. Protection of consumers against exploitation at the hands of natural gas com-

(Continued on page 110)



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*T. M. Reg. U. S. Pat. Off.

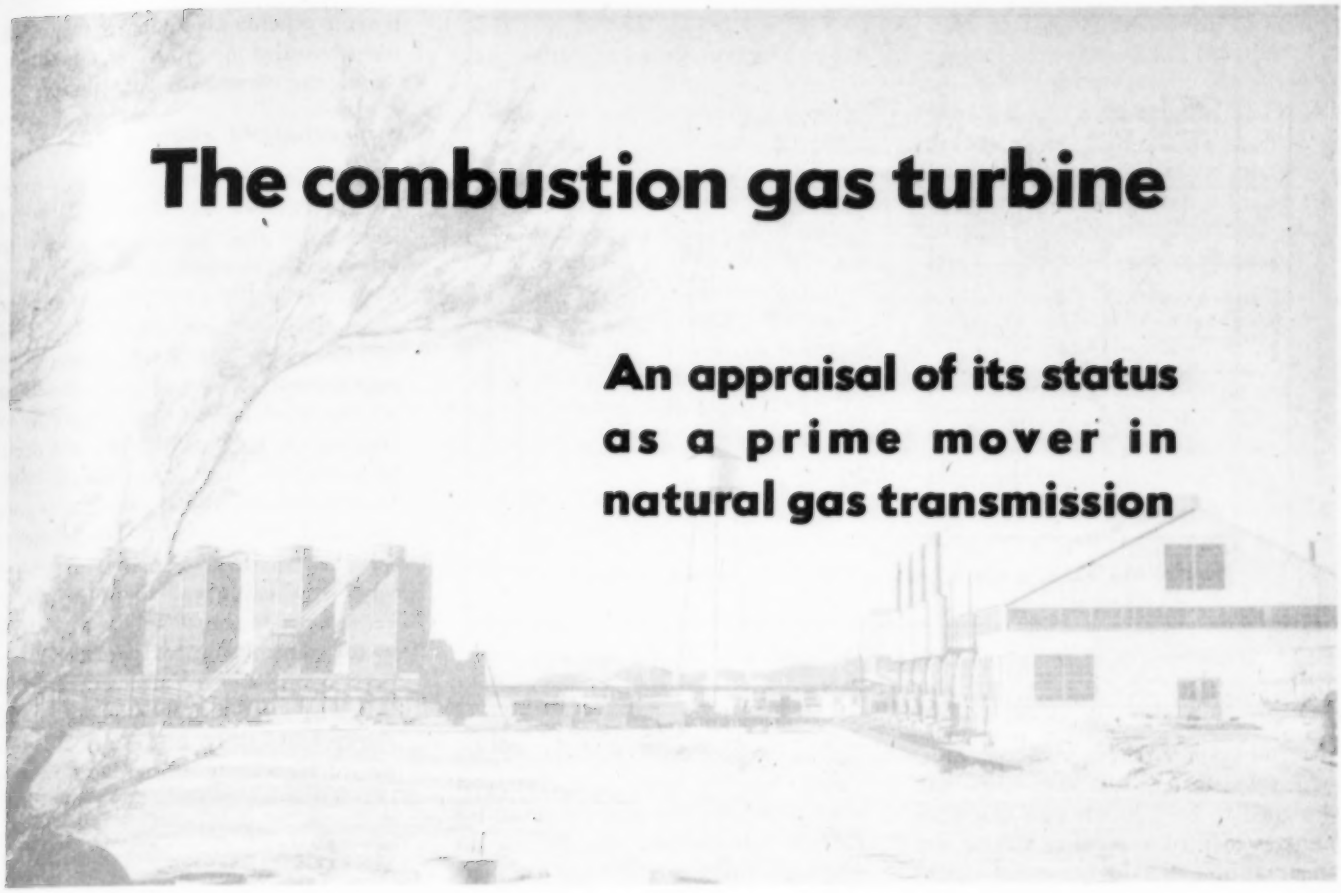
NATIONAL TANK COMPANY

TULSA, OKLAHOMA

1-5-54

The combustion gas turbine

An appraisal of its status as a prime mover in natural gas transmission



By TRACY S. PARK JR., Mechanical Engineer
Tennessee Gas Transmission Co., Houston

THE history of gas turbine-driven gas compressor installations spans a perior of five years and a total of approximately 222,000 hp. Industry has a natural reticence to accept new designs of equipment, and particularly so the gas industry, which as a whole has enjoyed tremendous expansion and success in the past 10 years using conventional prime movers and compressors. The appearance of gas turbines on the pipeline scene has had an appreciable effect on the transmission industry. Practically all transmission companies have made investigations concerning the feasibility of turbines as pipeline prime movers. On the basis of these studies, seven companies now own or operate a total of 40 machines. This does not include units that have been applied to associated process compression or electric power generation.*

Eight years ago, three years before the first application was made to gas pumping, the best motor-driven centrifugal compressors did well to attain a compression efficiency of 70%. Today, efficiencies of 83% are being guaranteed by the manufacturers of such equipment, and tests have indicated that efficiencies in the range 85-86% have been realized in some cases. During substantially the same period, pipeline gas turbine thermal efficiencies have increased from approximately 16% to 27.5%. Reliability of operation of both the gas turbine driver and the centrifugal compressor has apparently maintained pace with gains in efficiency. It now appears that the combination has attained the same degree of dependability as the modern high pressure steam turbine. Experience has demonstrated that operating labor requirements and installation costs compare favorably with conventional reciprocating compressor equipment. Maintenance costs will remain an unknown quantity until the machines now installed build up sufficient operational time to make a determination possible.

The factors brought out in the rather brief foregoing resume appear to have made the gas turbine-driven centrifugal compressor a competitive alternative for gas compression on pipelines. This is demonstrated by the fact that a total of 39 units are presently in service, with one additional machine undergoing installation.

A new application requires time for development

It appears that a total of 40 machines installed in a five-year period falls far short of being phenomenal. By investigating further, however, we observe

*A short resume summarizing other applications of the gas turbine appears in a previous paper by this author presented before the petroleum branch of the AIME, Oct. 21, 1953, entitled "The Combustion Gas Turbine—Historical Development and Present-Day Applications to Natural Gas Pipelines."

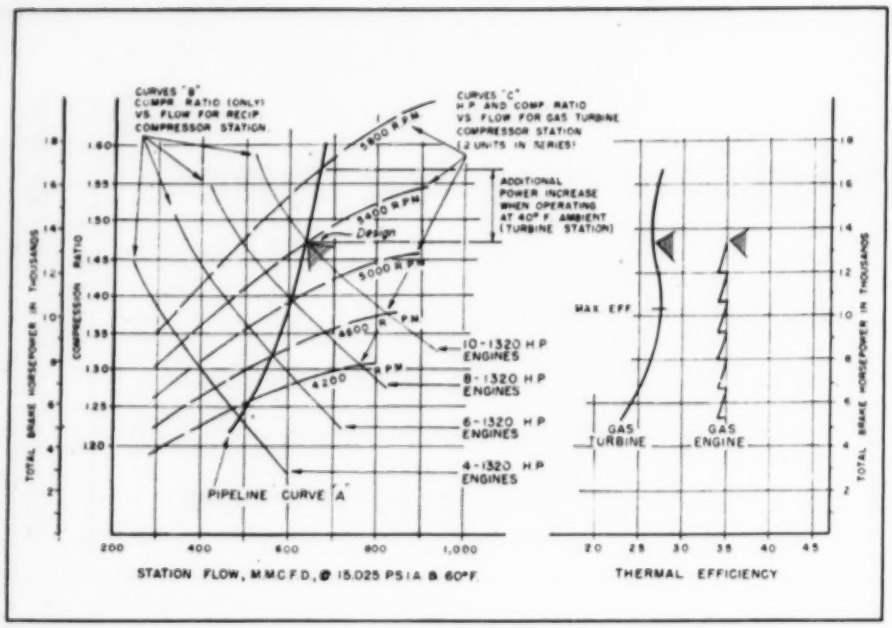


Fig. 1. Characteristics of two compressors superimposed on a pipeline operating curve.

that the original Westinghouse unit, which was installed in May 1949, was designed to be a locomotive machine, but was adapted to pipeline service. Its small rating (1850 hp) does not ideally adapt it to general pipeline service. Furthermore, the Clark turbine—the first machine specifically designed and built for gas pipeline service—did not commence regular operation until November 1952. The General Electric Co. was in full production during 1952 constructing turbines for El Paso Natural Gas, but until the fall of that year, did not have a single machine in operation on pipelines. The company could point to the successful operation of several turbines applied to power generation, but, of course, this experience could not be fully utilized to the satisfaction of the gas transmission industry.

Two causes

Thus it is apparent that the application effort of gas turbines to pipeline service has gained momentum only in the past two years, and has been the result of two causes: (1) the design of a machine possessing a horsepower rating, thermal efficiency, and first cost that make it attractive to the user and competitive with the conventional gas engine; and (2) the ability of a domestic manufacturer to produce these machines at a rate that will assure their availability to the gas industry when required. Proof of the above reasoning lies in the fact that 39 of the 40 machines installed have commenced operation only in the past two years. A foreign manufacturer, the Brown Boveri Corp. of Switzerland, has had available for purchase several sizes of single-shaft gas turbines for several years, and possesses a fine record of achievement for reliability. The availability of these European machines has had little effect on the pipeline applications. However, the Brown Boveri Corp. has contributed tremendously to the turbine art, and in this respect aided in the overall acceptance of gas turbines, including those designed for pipeline use.

Fuel rate considerations

The first large-scale installation of gas turbines were sold on a guarantee of 5000-hp output (at 80° F, ambient temperature) and a 25% thermal efficiency, based on the lower heating value of fuel. Compared to the fuel requirements of gas engine-driven compressors available at that time (about 30% thermal efficiency, depending on size and type), the turbine's economy was viewed with mixed emotions. Some industry members, sensing that installation, operating labor, and maintenance cost savings might overshadow increased fuel cost, were favorably impressed. Others believed that fuel requirements, even at the expense of greater over-all operating costs, should be held to a minimum, thus insuring a less rapid depletion of reserves. At any rate, the introduction of gas turbines to pipelines has apparently helped the transmission industry as a whole, due to the element of competition.

Supercharged engines

Supercharged two-cycle and four-cycle engines are now available in larger sizes than previously, and with thermal efficiencies averaging about 35%, or roughly a 10% improvement. Pipeline gas turbines recently (October 1953) enjoyed a 10% reduction in fuel requirements also, and are offered at 27.5% thermal efficiency. The cost of fuel gas has continually risen and occupies roughly 30% of combined operation and maintenance costs. It is fundamental that any further increase in fuel economy of prime movers—whether existing and in operation, or yet to be purchased—will be invaluable to the transmission companies. On the basis of the above analysis, it is probable that some reticence to purchasing gas turbines exists because of the continued superiority in fuel consumption of compressor engines.

Performance characteristics of reciprocating and centrifugal compressors

Until 1947, a centrifugal compressor did not exist on a gas transmission pipeline in this country. One of the first installations consisted of three 2000-hp motor-driven centrifugal compressors arranged in series, and were located on the Tennessee Gas Transmission Co. system at Station No. 110, Morehead, Ky. Mainline pipe was in short supply at that time and the station was constructed as an expediency in meeting contract demands for gas. The installation still remains, and is located on the same land tract as the gas turbine station. Large scale use of centrifugal machines commenced about the same time, when Texas Eastern Transmission Corp. acquired the Big and Little Big Inch lines and replaced the motor-driven pumps with compressors.

To this day, a general feeling persists in some transmission companies that centrifugal compressors do not match pipeline requirements. This is probably because of a misunderstanding concerning the machine's characteristics. It is virtually impossible to discuss centrifugal capabilities without re-

This article has been adapted from a talk presented at the NGAA annual convention in Dallas in April.

ferring to curves, and certain study is required to understand them. Thus, it has been apparent that any manufacturer attempting to explain and sell gas turbines has of necessity been required to do likewise with the centrifugal compressors that they drive.

In determining pipeline gas turbine performance it is necessary to consider the centrifugal gas compressor as an integral part of the system. The gas compressor is the end to which all efforts on the turbine must be directed in order to produce an efficient workable combination. The pipeline compressor in itself has no cognizance of its driving force, and to that end, it could be powered by a steam turbine, electric motor, or geared through a speed increaser to a reciprocating gas engine. The only impulse it can receive and recognize is speed and torque to its impeller. Moreover, the compressor does not set up its own operating requirements when it is placed on a pipeline. The line has a characteristic, depending on the inside diameter, length, and efficiency. The latter is a function of the inside conditions of the wall and the existence of any obstructions to the flow of gas.

Characteristics established

Operating characteristics of reciprocating compressors are firmly established and understood. It is fundamental that by means of the manipulation of clearance pockets on the compressors, an engine can deliver its constant rated load over a wide range of compression ratios. Thus, the compressors can deliver a large volume of gas at a low ratio, or a small volume of gas at a high ratio—all at constant load. On the other hand, centrifugal compressors require speed changes to vary the compression ratio, which in turn varies the horsepower required of the prime mover.

It should be interesting to superimpose the characteristics of the two compressors on a pipeline operating curve and note the different manner in which the two compressors accomplish the same end. *Fig. 1* portrays such a picture. Curve A is a plot of the Panhandle Equation for flow in a 30-in. pipeline, and assumes a constant discharge pressure of 900 psig at the plant, and a station spacing of 70 miles. The station 70 miles upstream from the one shown also discharges constantly at 900 psig. With these conditions set, flow in MMcfd is plotted against compression ratio and brake horsepower. As flow is increased, pressure drop along the line is increased, and the suction pressure at the plant is lowered. Hence, with a constant discharge pressure, the compression ratio and brake horsepower increase with flow. Curve A therefore shows required pipeline horsepower and compression ratios for various quantities of flow to meet the conditions as set up. The design point of this station, as indicated, is 640 MMcfd at a 1.47 compression ratio. This calls for approximately 13,300 installed hp.

Case 1: Reciprocating compressors

To meet design conditions, assume that 10 1320-hp compressor engines are installed, or a total of 13,200 hp. Superimposed lines B represent compression ratio vs. volume curves at constant horsepower for 10, 8, 6, and 4 engines respectively. The horsepower ordinate does not apply to these curves, except where they intersect the pipeline characteristic A. If it be desired to reduce flow to 600 MMcfd, two engines may be shut down, and eight engines will suffice. If flow should further be reduced to 560 MMcfd, six engines will be required. At 490 MMcfd, four engines will do the job. At any desired flow between curves "B"—say 540 MMcfd—five engines will operate at full load and one at partial load.

Load factors less than 100% are therefore obtained by removing engines from service one or more at a time, thereby allowing the remaining engines to operate at full load, with the possibility of one engine operating at partial load. Economically, this has proved to be good, since the engines in operation at reduced load factors are loaded and running at maximum efficiency. The gas engine efficiency curve, *Fig. 1*, graphically indicates this.

Case 2: Gas turbine-driven compressors

Gas turbines similar to those installed on El Paso's system are now rated 6700 hp at 80° F ambient temperature, with 5400 rpm of the load shaft. To meet the same design conditions stated before, two of these machines will be required with the centrifugal pipeline compressors arranged in series. For any given operating point on the pipeline Curve A, the compressors run at identical speeds, and each operates at the same compression ratio, which would be the square root of the ratio across both machines.

Superimposed lines "C" represent characteristic horsepower and compression ratio vs. volume curves for various synchronized compressor speeds ranging from 5800 rpm to 4200 rpm. The 5400-rpm speed line intersects the pipeline curve at design horsepower and compression ratio. If it be desired to reduce flow to 600 MMcfd, both machines will be reduced in speed to 5000 rpm. If flow should further be reduced to 560 MMcfd, 4600 rpm will be required, and at 510 MMcfd, 4200 rpm will suffice. Load factors less than

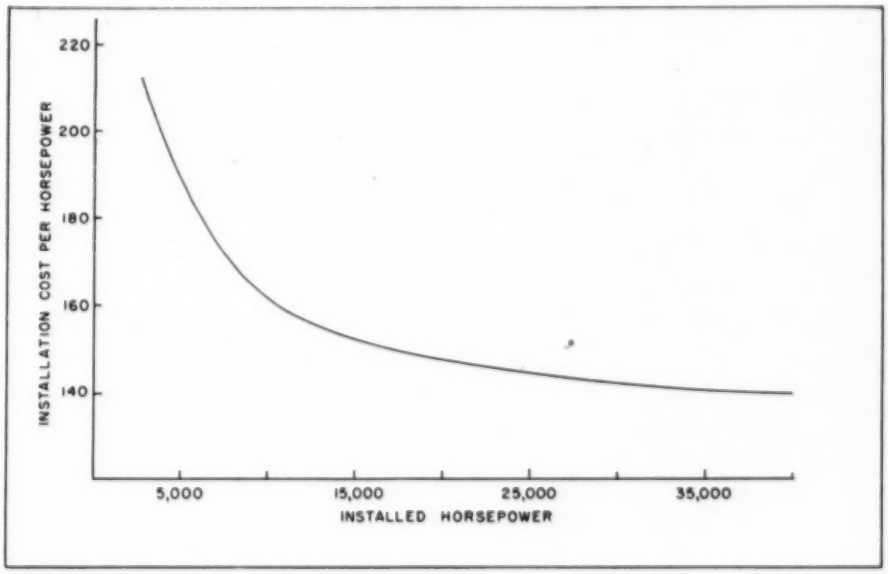


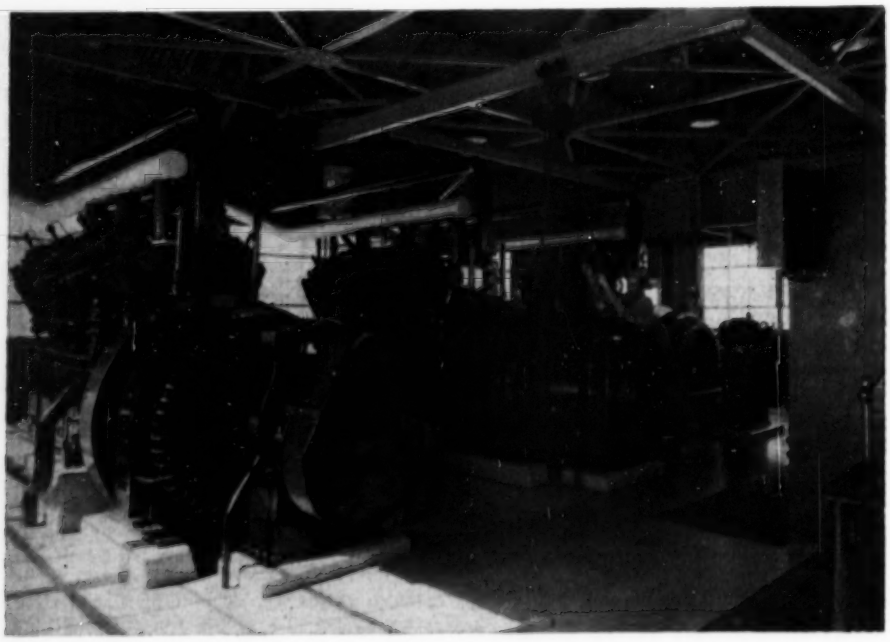
Fig. 2. Plot of total installed two-shaft gas-turbine horsepower vs. unit installation cost.

100% are therefore obtained by reducing the speeds of both machines simultaneously.

If a flow corresponding to 6700 bhp is desired, one machine may be removed from the line, and the speed of the remaining machine increased back to 5400 rpm if desired. This phenomenon, however, is not shown. The gas turbine efficiency curve, *Fig. 1*, graphically illustrates the thermal efficiency variation with load. Note that maximum efficiency of 27.5% occurs at 10,400 hp, or 5200 hp per machine. At design load of 6700 hp per machine, the efficiency is 26.5%.

For pipeline overload conditions, gas turbine plants have the advantage that they can produce up to 25% additional power as a result of low ambient temperatures. This increased power is not considered as overload on the turbine, as the design turbine inlet temperature is not exceeded. The above design conditions are specified for an 80° F ambient temperature. Should this temperature drop to 40° F (wintertime conditions), the axial flow compressor shaft (operating at constant rpm) will compress a greater volume of the cold, dense air, thus delivering an increased mass flow to the load turbine. Output per turbine increases from 6700 hp to 8400 hp, and the load shaft speed increases from 5400 rpm to 5800 rpm.

Fig. 1 indicates that gas flow can be increased from 640 MMcfd to 670 MMcfd when the compressor is operating at the lower ambient temperature. Engines enjoy only a slight increase in power due to lower temperatures—about 1% for every 10 ° reduction in ambient.



Best practice indicates that auxiliary power be provided by a separate engine driven generator.

Installation cost of gas turbine-driven centrifugal compressor stations

Fig. 2 is a plot of total installed two-shaft gas-turbine horsepower vs. unit installation cost. It does not represent actual cost data taken from completed plants. Costs were estimated using current prices for the turbines, auxiliaries, required piping and valves, structures, concrete, and electrical equipment. Gas cooling equipment was not included, since compression ratios are not usually in the range required to justify the additional expense. Land, company housing, contractor's fee, and contingencies were excluded. These costs are somewhat intangible and subject to considerable variation. For a given size plant, they can be computed and added to the unit figure indicated on the ordinate.

Reasonable cost correlation for reciprocating compressor installations is difficult, and in most cases, a curve such as the one shown in *Fig. 2* is even meaningless. The plants are built in a wide variety of styles. Some have cooling towers for gas aftercooling and others do not. Some incorporate a unitized system in which most auxiliaries are driven directly from the compressor engine shaft, while others employ a rather large generating plant with motor drives for the auxiliaries. Thus, design techniques among the gas transmission companies vary so widely that a single estimating curve would be of no value to the industry.

The costs of gas turbine compressor plants, however, appear capable of some predetermined estimating method, such as the curve in *Fig. 2*. They are inherently simpler, and possibly offer less opportunity for the ingenious designer to omit, swap, or otherwise change equipment.

It is interesting to note that when gas turbines were first installed on a large-scale basis, the equipment cost for turbine plus pipeline compressor (including certain controls and auxiliaries) was in the range $135—$140 per horsepower. Presently, this cost averages about $101—$104 per horsepower, which has made it considerably more competitive. Reported installation costs on some of the stations installed indicate fairly close correlation with the curve in *Fig. 2* if the latest horsepower rating of 6700 is used. This should be realistic, since the machine is basically the same.

Operating costs of gas turbine-driven centrifugal compressor stations

Reasonable correlation is difficult to achieve on a dollars-per-horsepower-per-year basis unless considering a plant of specific size. A curve similar to the one shown in *Fig. 2* would be necessary in order to correlate annual unit operating costs with the size of plant. It is impossible to formulate such a curve because maintenance costs are not specifically known and operating labor costs have not completely stabilized.

Sufficient data may be found in available literature to substantiate the following generalities:

Operation:

(1) Fuel, based on a fully loaded station: The fuel rate considering gas of 0.6 specific gravity and 1000 Btu per cu ft heating value is approximately 81 Mcf per horsepower per year. This cannot be converted to dollars and be of value, as the cost of field gas is not the same for each transmission com-

pany. The rate of 81 Mcf, however, can be multiplied by any gas price and establish a fuel cost, which will be proportional to installed horsepower.

(2) Operating supervision: This expense would include the total wages of probably two men—a station superintendent and a clerk or accountant. Any portion of their time spent on maintenance would be deducted and charged as such. This expense should be very nearly the same as gas companies are now experiencing, and independent of the installed horsepower.

(3) Operating labor: Tennessee's gas turbine plant in Morehead, Ky., utilizes two men per shift—an operator and an assistant. One man would suffice, since the station is semi-automatic, but for safety and phychological reasons, two men per shift are preferred. A conservative plan, therefore, indicates a force consisting of eight men, when considering a station comprising from one to about six machines.

(4) Lubricants: The reported oil consumption of gas turbine plants in operation is 1 gal. per 30,000 bhp hours, and is considered very good compared with reciprocating compressors with an oil consumption in the range 2500 to 5500 bhp hours per gallon. This expense is also proportional to the installed horsepower.

(5) Water treatment: If gas aftercooling is not employed, the water requirements of both engines and turbines are low. Both operate on a closed water system, and make-up is required only in the amount that is lost by evaporation through venting and leaks. Gas turbines circulate approximately 3 gal. per horsepower per hour, while engines require from 16 to 30 gal. per horsepower per hour. For either type of plant not employing gas aftercooling, this expense is so low as to be considered negligible by comparison with others.

(6) Auxiliary power requirements: To operate necessary auxiliaries and control equipment, approximately 1% of the rated gas turbine horsepower is required. Best practice indicates that this auxiliary power be provided by a separate engine driven generator. Conventional reciprocating compressor plants normally require from 3 to 4% of installed horsepower to operate auxiliaries.

Maintenance:

This is the one large factor in turbine compressor plants that still remains an unknown quantity. The expense includes both labor and material, and may be divided into (1) buildings and structures, (2) compressor machinery, and (3) other equipment.

Maintenance on *buildings* and *structures* can easily be estimated from past experience, although it should be kept in mind that the buildings normally will be smaller and require less upkeep.

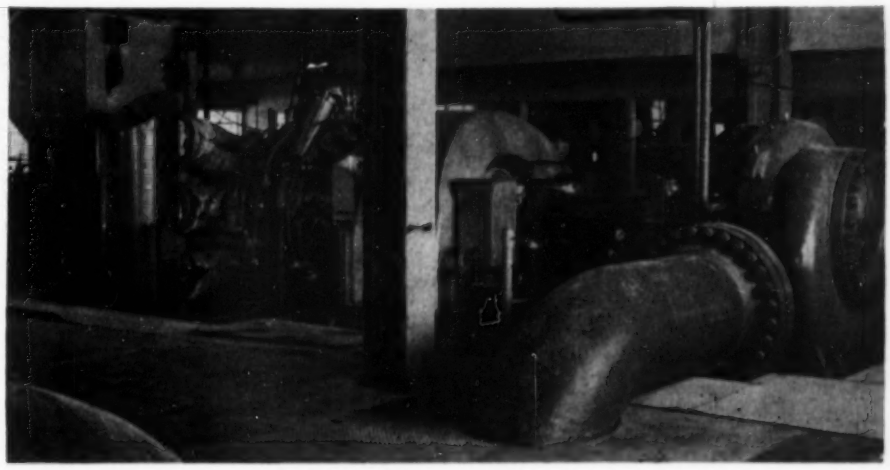
Compressor machinery applies to the gas turbine (including all auxiliaries furnished by the manufacturer, such as the regenerator, inlet air filter, water and oil coolers, water and oil pumps, and the electrical or pneumatic control system), and the pipeline centrifugal compressor (including all auxiliaries, furnished by the manufacturer, such as the seal oil system and safety controls).

Insufficient operating time does not permit maintenance expense on *compressor machinery* to be accurately determined.

Other equipment encompasses all items not included in the above two categories, such as gas scrubbers, all compressor station piping, gas aftercooling facilities (if installed), water wells, valves, and auxiliary engine-driven generators. This equipment is conventional, and maintenance expenses can easily be estimated from past experience.

The only real unknown in the above outline is *compressor machinery*. The error in estimating overall maintenance expense can be reduced by accurately determining labor and material expenses for *buildings* and *structures* and *other equipment*, which will be a substantial percentage of the total. Information can then be secured on maintenance expenses for gas turbines and centrifugal compressors that have accumulated considerable operational time in other than pipeline applications. This estimate can be applied conservatively to *compressor machinery*, and thereby arrive at overall maintenance expenses for a gas turbine-driven centrifugal compressor station.

The El Paso Natural Gas Co. has reported that all direct expenses on its gas turbine plants, excluding fuel, are not expected to exceed one-half of the reciprocating cost of $22.20 per rated horsepower per year. They further report that actual expenses thus far, excluding fuel, are $8.25 per horsepower per year, based on a typical 15,000-hp station.



El Paso Natural reports that actual expenses on its gas turbine plants, excluding fuel, are $8.25 per horsepower per year, based on a typical 15,000-hp station.

Information pertaining to compressor station layout, piping design, description of equipment and control apparatus, and operational procedures has purposely been excluded. Numerous papers have been published relating to these phases, and are available to anyone desiring to go into more detail.

Individual characteristics

Each gas transmission system in this country must have design and operating characteristics of its own, which will depend on location, total sales volume, allowable pipeline pressure ratings, and locations of gas purchase and sales points relative to the system. Enough data are now available on gas turbines and centrifugal compressors to enable any transmission company to make a feasibility study regarding the use of this combination.

Fig. 1. Pipeline being built between two high-voltage power lines.

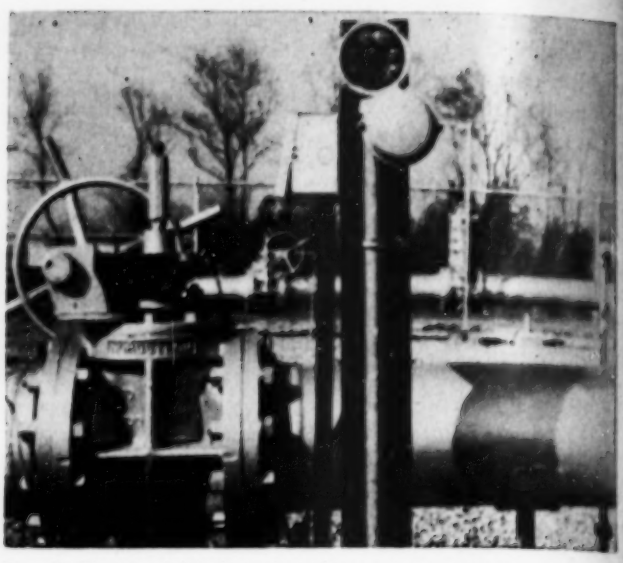


Fig. 2. Terminal block with spill gap-type arrestors connected across insulated joint.

Insulating joints in long pipelines

Part 1. Needs, hazards, protection

By **M. C. MILLER** • Allendale, N. J.

INSULATING joints, flanges or bushings are almost a necessity in long pipelines and in distribution system piping, to separate various sections electrically. They are installed at strategic locations to break up the pipelines and systems into short electrical sections to reduce or limit the pick-up and discharge of electrical current from stray railway current, magnetic earth current and stray current from adjacent lines that are under cathodic protection; to reduce the magnitude of alternating potentials and current induced from nearby high-voltage power lines, and to reduce current that would flow in the pipelines during a phase-to-ground fault on an adjacent power system.

Insulating points are used also to reduce corrosion from normal or natural causes, such as on a line extending through areas of different soil conditions, and on lines connected to structures of other metals.

The use of insulating joints is essential to permit economical and practical application of cathodic protection to many lines and distribution systems.

Long cross-country pipelines extend through areas of widely different soil conditions, cross and parallel many other pipelines and underground cables with and without cathodic protection; extend over mining areas where substantial stray current potentials and current are encountered; parallel or cross under high-voltage power system transmission lines, many of which operate with a "Y" connected system with the midpoint grounded; and extend many miles through sections of the country where magnetic earth potentials and currents are encountered. At terminals of these long lines they may be electrically tied in with extensive underground systems such as distribution systems and large industrial customers' underground piping—unless insulating joints are installed.

Where insulating joints are not provided at terminals, these lines may be interconnected with distribution systems, which, in turn, may be interconnected with electric system copper grounding networks and with electric and communication systems underground lead cables. Such interconnections of many different metallic systems utilizing galvanized and bare steel, copper, and lead and other metals can and do cause extensive corrosion.

It is becoming standard practice by many companies to install insulating joints along pipelines and at all terminals to break up these interconnections. This practice usually is highly desirable and beneficial and consideration of adopting such a practice is recommended.

Insulating joints in long pipelines and at terminals of long lines cause operating problems and may create physical and explosion and fire hazards, especially where these extend through areas net-worked by high-voltage transmission power lines. Suitable precautions are essential to reduce or eliminate these problems and hazards.

There is urgent need by the industry for more information on possible operating problems and hazards that may result, and on remedial measures and safety precautions that can and should be taken. Information is needed also to be used as a guide to determine when and where to install insulated joints; information on magnitude of induced alternating-current potentials and ground fault current; effects of lightning, and effects of coating, flange and soil resistance.

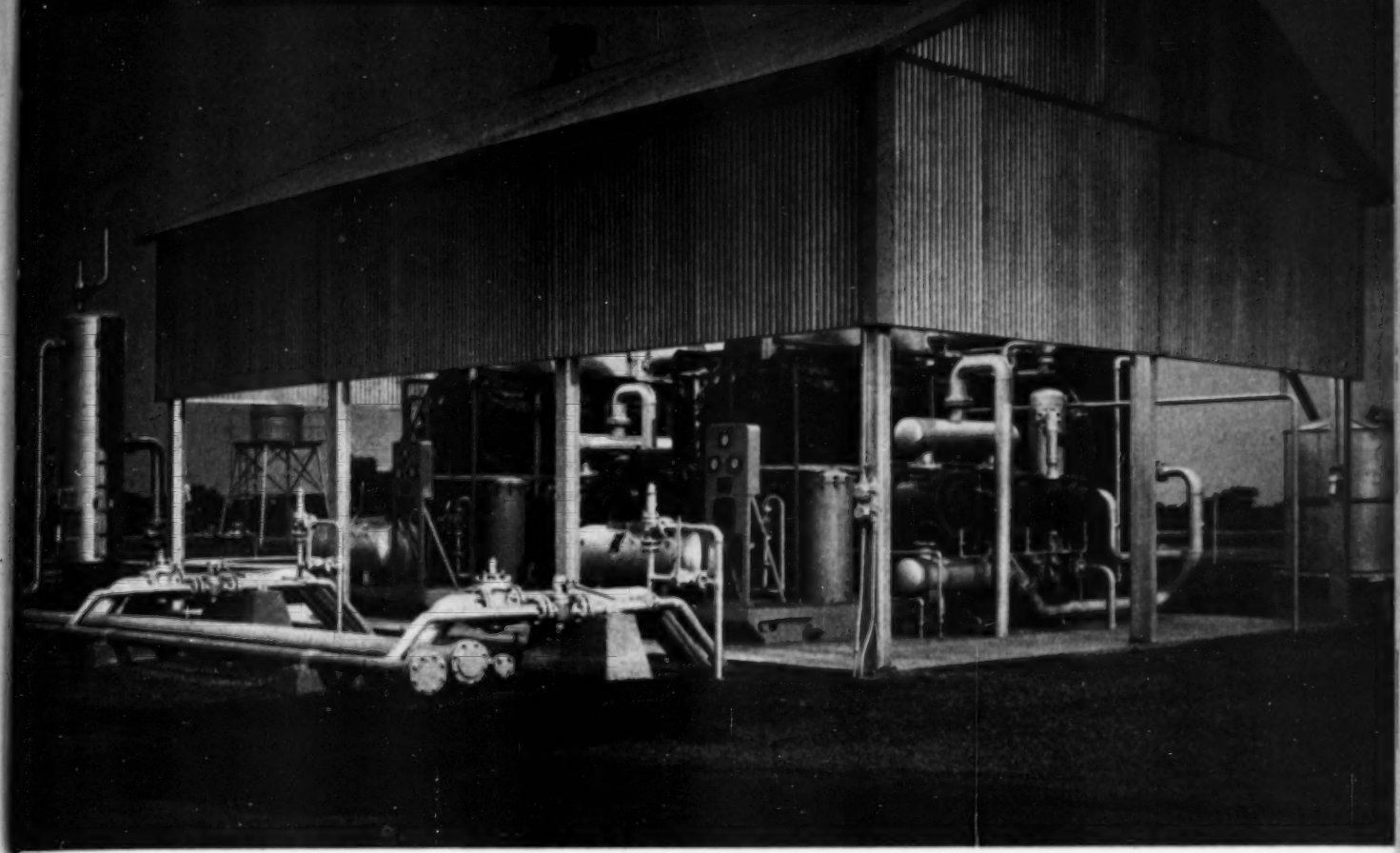
To show the need for such information the following excerpt is taken from a letter received recently by AGA headquarters from a member company.

"We have experienced very recently an incident in which an explosion and fire occurred within our gate boxes very close to a regulator and meter set-up. It is the opinion of our cathodic engineer that lightning struck some dstance from the point of ignition and followed an 8-in. line, buried, into this particular pit housing on 4-in. gate and one 8-in.

This article is adapted from a talk presented at the AGA distribution conference in April.

BEAIRD-INGERSOLL-RAND
Packaged Compressor Plant

Lowest Cost Per Horsepower Installed



This packaged compressor plant is complete with two Beaird-Ingersoll-Rand 6SVG, 380 h.p. gas engine driven compressors, Young radiators and all necessary equipment and controls. Other sizes from 110 h.p. to 660 h.p.

Operating Profits Increased —

PACKAGED COMPRESSORS OPERATE GAS LIFT . . . CONSERVE FLARE GAS

SEABOARD OIL COMPANY designed their Plymouth compressor station to meet rapidly increasing gas lift requirements and to convert to profits 1,500,000 cubic feet of gas being flared daily.

With an eye toward future development of the field two Beaird-Ingersoll-Rand packaged compressors were installed. These units have a combined capacity of 3,140,000 Std. cu. ft. of gas per day when operating with suction at a constant pressure of 28 psig and discharging at 750 psig. Necessary controls are incorporated in the design to operate at discharge pressures ranging from 750 psig to 1000 psig. There is ample capacity for gas lifting and the delivery of excess gas into the sales line.

Designed into Beaird's flexible packaged compressor is an automatic speed control to adjust for variations in the rates of gas production. The #1 unit is operated at constant speed while the speed of the #2 unit is automatically increased or decreased to maintain a constant suction pressure.

A plus feature of the Plymouth station is its automatic operation. Built-in controls guard the plant day and night against sudden changes in operating conditions. The entire installation has required no additional personnel.

Beaird packaged compressor plants are also adaptable to gas boosting, repressuring, air compression, refrigeration, pipeline testing and other services in the field where gas is compressed.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your requirements.

THE J. B. BEAIRD COMPANY, INC.

Shreveport, Louisiana

SINCE 1918 BEAIRD SHREVEPORT

MACHINING MANUFACTURING STEEL WAREHOUSE

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

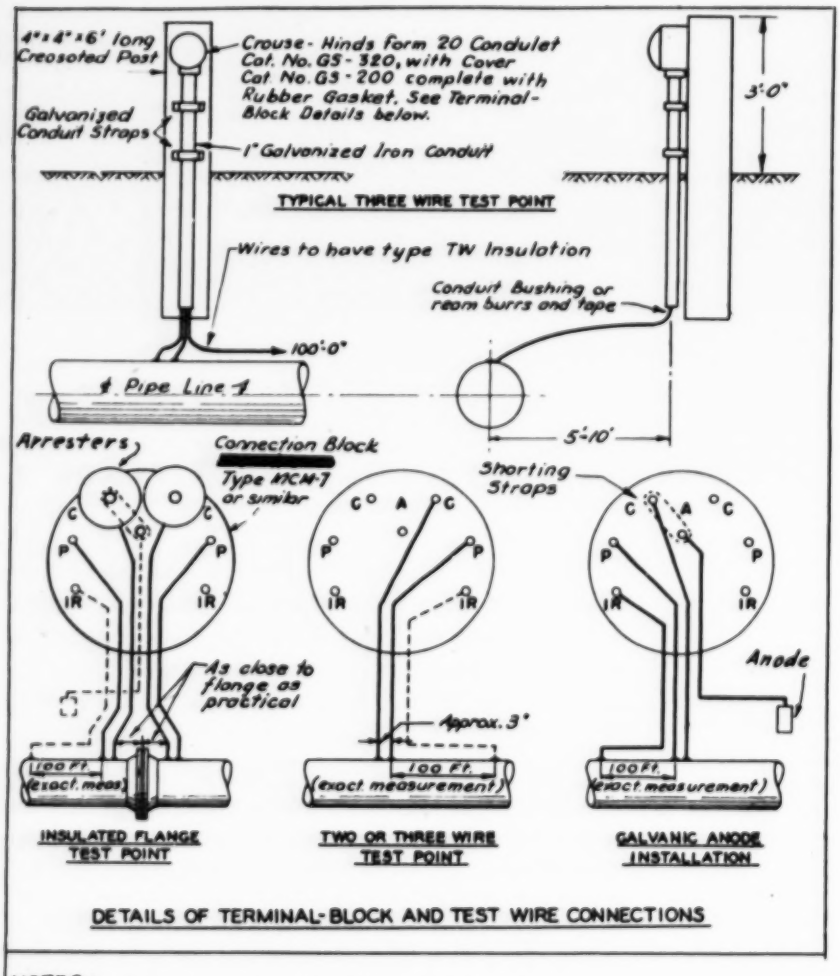
Combustible gases were in both pits or the explosion would not have occurred, but that is not the point. The upstream side of the pit contained an insulated coupling. It is the supposition of our engineers that this spark jumped this gap, creating the ignition.

"Do you have any cases in your file of a similar nature wherin damage was done to an installation, or has a fire started in any of the above installations through this lightning as a factor? It is quite a possibility that you might have access to cases where the above factors have been proved.

"It has been tentatively agreed that all insulated couplings should be removed further upstream if at all possible.

"Several other factors have been considered, such as stray currents through whatever sources they might have come. Of course, this is all considered to be direct current. This is very urgent with us and if it is at all possible, I would appreciate some reply as soon as possible. Has it been recorded that any company has had the above trouble and have they removed the insulated couplings in any manner?"

Fig. 5. Pipe-to-soil potential of Atlantic side measured at Arraijan tank farm with all magnesium and rectifier installations off.


4"x4"x6' long Creosoted Post
Crouse-Hinds form 20 Condulet Cat. No. GS-320, with Cover Cat. No. GS-200 complete with Rubber Gasket. See Terminal-Block Details below.
Galvanized Conduit Straps
1" Galvanized Iron Conduit
TYPICAL THREE WIRE TEST POINT
Wires to have type TW Insulation
Conduit Bushing or ream burrs and tape
3'-0"
100'-0"
Pipe Line
5'-10"
Arresters
Connection Block
Type MCM-7 or similar
Shorting Straps
As close to flange as practical
Approx. 3"
Anode
100 Ft. (exact meas.)
100 Ft. (exact measurement)
100 Ft. (exact measurement)
INSULATED FLANGE TEST POINT
TWO OR THREE WIRE TEST POINT
GALVANIC ANODE INSTALLATION
DETAILS OF TERMINAL-BLOCK AND TEST WIRE CONNECTIONS

NOTES:
Connections in condulet should be in the same direction as connections to pipe, i.e. wires from right side of Test Point should be connected on right side of condulet.
C = Terminals for Current leads.
P = Terminals for Potential leads.
IR = Terminals for measuring IR drop used in conjunction with Potential Terminals.
A = Terminal for Galvanic Anode lead.

Fig. 3. Installation of terminal block and test leads and disc-type lightning arrestors across insulated joint.

Some information from member companies was available to answer this inquiry. Conferences such as this one furnish information and experience data to help the industry solve its problems.

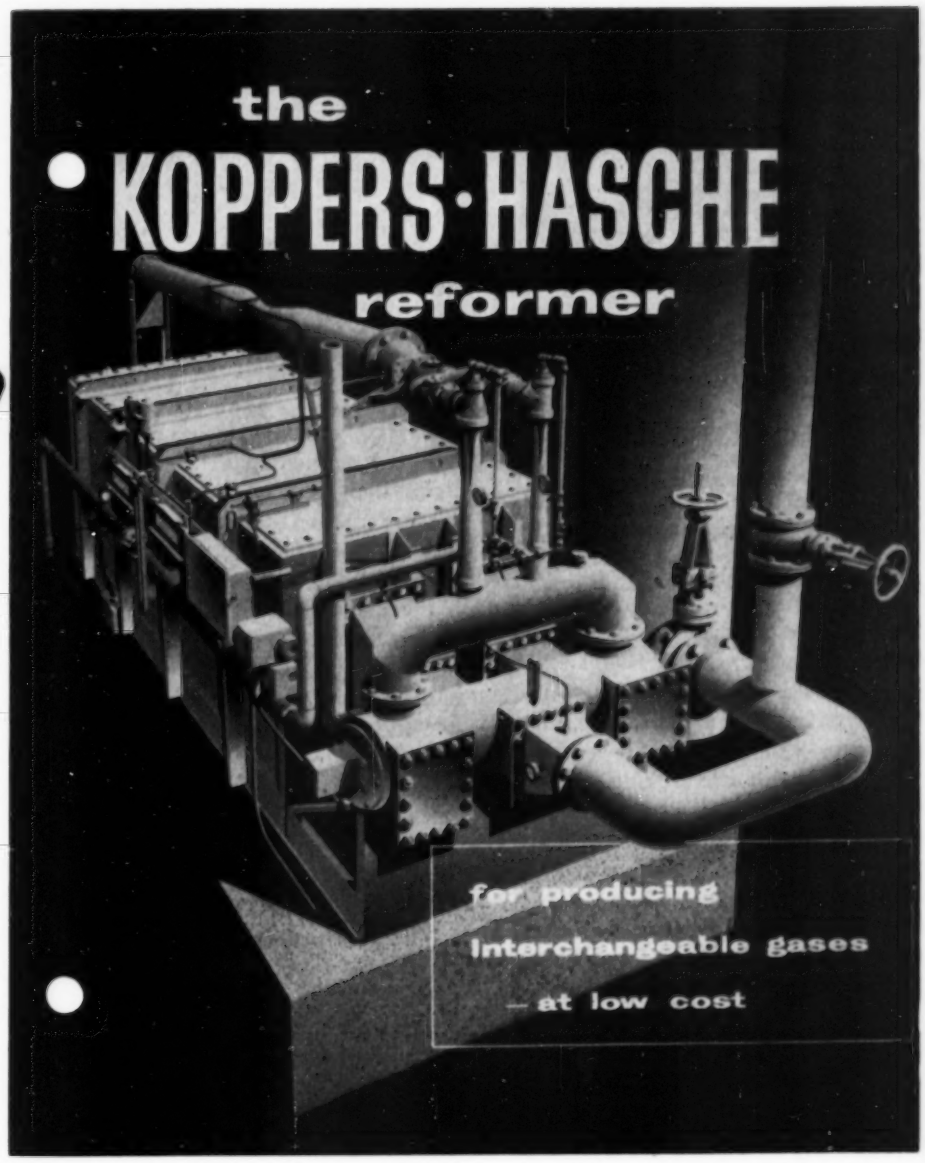
As a further example, I mention the following:

During the construction of about 150 miles of well coated pipeline, a workman received a shock (not at all serious) where two long sections of the line were tied together. Sparking, with a frying noise, was reported with the ends of two sections held about half an inch apart. The two sections parallel two high-voltage transmission lines—being located between the two power lines about 15 ft from the 110 kv line and about 40 ft from the 44 kv line as shown in *Fig. 1*. No lightning was observed at the time in the immediate area. At one end of the same line, an insulated flange was shorted during final stages of construction and before lightening arresters were installed. It may have been caused by power system current flow in the pipeline and arcing across the insulation in the flanges during a fault on the power system.

Later, after the pipeline was completed, the corrosion engineer designed the cathodic protection system and protective measures to eliminate hazards, observing spitting across a set of spill

Peak-Load Problems?

Free booklet suggests an economical solution



● Here's a new booklet that should be "required reading" for utilities that distribute gas and for industrial plants that use gas. It describes the Koppers-Hasche Furnace—the furnace that produces low-cost gas that is interchangeable with most natural and manufactured gases.

This booklet tells how the Koppers-Hasche Furnace helps meet sudden and unexpected peak loads . . . how it swings into action when there is a line breakage or other temporary failure of the gas supply. It also explains why the Koppers-Hasche Furnace is low in first cost and inexpensive to operate.

After reading this booklet, we think you'll agree that the Koppers-Hasche Furnace is ideal insurance for gas-supply emergencies and peak loads. Get your copy of this informative booklet by sending in the handy coupon.

Koppers Company, Inc.
Engineering and Construction Division
Chemical & Gas Dept.
Pittsburgh 19, Pennsylvania

Please send me, without charge or obligation, a copy of your new booklet on the Koppers-Hasche Furnace.

Name .....

Address .....

City ..... Zone ..... State .....

KOPPERS

KOPPERS COMPANY, INC.

Engineering and Construction Division
Pittsburgh 19, Pennsylvania

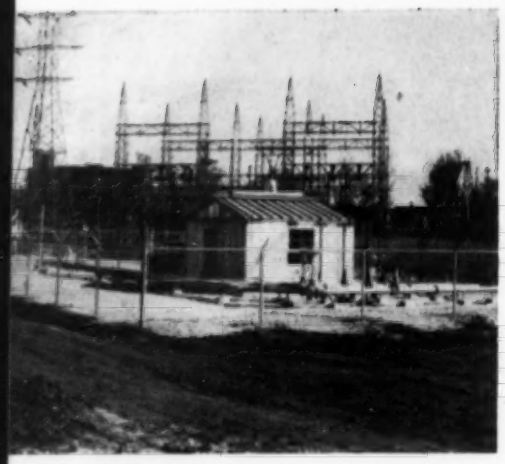


Fig. 4. Terminal of long pipeline adjacent to terminal of high-voltage transmission line. Insulted flanges at such locations need adequate protection.

gap-type arrester discs which are installed as shown in *Fig. 2*. The gap was set at 0.025 in. between edges of the discs. Preliminary tests indicate that these gaps will break down at about 2000 volts with this setting. A few minutes later, he measured a residual alternating current potential of 16 volts. The gaps can be set with a distance of from about 0.005 to 0.030 in *Fig. 3* shows connections of current and potential test leads at an insulated flange.

A condition where adequate protection of an insulated flange is very essential is shown in *Fig. 4*. Faults - to-ground on the power system may result in considerable current flow in the transmission pipeline toward this meter station, and considerable alternating current potentials could be built up across an insulated flange at such a location if it were not adequately protected.

During corrosion surveys and the design of cathodic protection system for pipelines crossing the Isthmus of Panama in the Canal Zone, unusually large and constantly varying values of direct current and potentials were encountered. These were found to be caused by magnetic earth potentials and current flow. A typical recording chart is shown in *Fig. 5*. Even though these pipelines are only about 50 miles long, they were interconnected at each end and at other locations along the lines to extensive underground piping systems, which resulted in considerable current pick up and discharge. Current flow in the pipelines as high as 35 amps was measured.

Insulated flanges helped to break up the line into shorter electrical sections and reduced the cathodic protection current requirements. But it was very necessary to select suitable locations for the insulated joints to avoid explosion hazards.

Magnetic earth currents and potentials have been measured on pipelines in the United States. We have measured magnetic earth potentials of about 2 volts per hundred miles through Ohio and Tennessee. Without insulating joints, it would have been very difficult to apply cathodic protection to those lines.

Part 2. Insulating joints

By RALPH E. KUSTER, Corrosion Engineer
Union Gas Co. of Canada, Chatham, Ontario

THE Union Gas Co. has used couplings, insulating sleeves, and insulating flanges in its transmission lines and distribution systems since 1949.

Initially, the first consideration when recommending the use of these insulating materials was one of corrosion control. However, the possible hazards arising from lightning and high-tension fault currents, especially in the presence of explosive atmospheres, is now recognized. Now before an insulating flange or insulating sleeve is recommended for corrosion or stray-current mitigation, the necessary protection from lightning or high tension fault currents must be satisfied.

The following examples show where our company employs insulating couplings:

Several insulating flanges have been installed below ground on a 60-mile, 16-in. all-welded and coated line which closely parallels a high-tension power line for a portion of its length. The insulating flanges were installed to protect against "long-line" currents, and to interrupt the flow of stray currents from electrified railway systems. Across each insulated flange are calibrated shunts, which tend to block the stray currents, and should safely allow high-fault currents or lightning surges to pass by the insulating flange without damaging it. However, the installation of 500-volt power line arresters across these flanges is being considered. A new 6-in. all-welded and well coated branch line is insulated from this 16-in. high pressure transmission line and has insulating flanges placed below ground, approximately 2000 ft at locations where crossing foreign lines are known to carry stray currents.

Another example deals with dual 10-in. transmission lines, one all-welded and well coated, the other fairly well coated and coupled, which closely parallel each other for approximately 50 miles. To achieve complete flexibility of operation, the two lines are periodically connected to headers. The all-welded and coated line, being cathodically protected, is insulated from the coupled line at both the upstream and downstream side of the headers. To provide for pipeline continuity on this cathodically protected line, No. 1 Flameseal wires are connected across the headers and it is hoped that no further measures will be necessary for handling possible lightning surges.

One of our storage-pool lines an all-welded bare line, has numerous branch gathering lines to storage wells. These well heads are insulated from the gathering lines, since only the storage-pool line and the gathering lines are cathodically protected. In this particular storage area, wells are enclosed in houses.

Two other storage pools have coated storage lines to the wells. These lines are insulated from the well casings by means of insulating flanges. However, heavy-duty resistors are installed across the flanges for the adjustment of forced drainage currents that are protecting the well casings and the storage-pool lines. It is doubtful if these resistors would withstand lightning surges. As yet our company has experienced no fire damage or insulating-flange damage due to lightning. However, the possibilities are there and we are studying the relative merits of such materials as spark-gap-type lightning arresters and thyrite resistors for safely handling lightning surges and possible power follow-ups.

As a safety precaution, our personnel have been instructed to use bonding clamps when working on insulating flanges. Bonding clamps are also recommended when a cut is made in any all-welded transmission line as the arc that could result from stray currents, cathodic protection currents (near a rectifier) or high-tension power line fault currents, might cause bodily injury or gas fires.

What the Supreme Court decision may mean to Phillips and others

Now that the Supreme Court has declared Phillips Petroleum Co. subject to Federal Power Commission jurisdiction, the obvious question that immediately arises is, "What will this mean to the natural gas industry?"

The question has two basic aspects. First, Phillips is a producer, and the effect of the decision is likely to be felt by most, if not all, producers. Second, Phillips' holdings are immense, with "proved" reserves totaling 17.89 trillion feet, nearly one-tenth of the nation's total, so the effect on Phillips alone will be felt directly by a large segment of the gas consuming public and the middlemen who distribute the gas.

When Phillips' president Paul Endacott spoke before the New York Society of Security Analysts March 23, he gave some clues to the magnitude of the effect on his company and on the entire industry. The following are selected excerpts from his talk:

I HAVE been asked, *"What special significance is there in the character of Phillips recent growth?"*

First, it should be understood that three-fourths of our investment growth has occurred in the past 10 years. During the last five, assets have doubled to cross the billion dollar mark last June. Though the greater part of this recent expansion continued to be through channels conventional to the oil industry, it was featured by a heavy participation in two other important lines of activity—natural gas and petrochemicals.

Several years ago an almost insatiable demand for natural gas touched off a great surge of long-distance pipeline construction. Before all the ramifications of our company's participation in supplying this demand could be fully digested, a flood tide of new developments broke loose in petrochemicals. Phillips was peculiarly fitted to take advantage of the varied opportunities arising out of these mushrooming trends because it already had assembled the industry's largest proved reserves of natural gas, had built up the highest daily output of natural gas liquids, and had accumulated over a long period of intensive research and development the basic knowledge and experience required to extract, separate, and chemically convert hydrocarbons. Phillips has long held the conviction that these particular growth activities are essential ingredients of the integrated oil company of the future.

It is inherent in a natural gas project that income to the producer and processor in the beginning is low in comparison with the average level to be realized over the entire life of the investment. New gas pipelines must obtain their gas initially at relatively low prices to accomplish financing and to survive the early period of low volume and relatively high operating costs. The starting prices paid under a typical gas sales contract frequently yield the producer a lower return on his investment than he could have earned by investing the same amount in other phases of the oil business. However, under the terms of most contracts the prices increase at stated intervals throughout the life of the contract, which may be 20 to 30 years or for the life of the properties from which the gas is produced. Also, future years are less burdened with operating expense than with most petroleum operations.

The company, therefore, has chosen to invest large sums in the many ramifications of the natural gas business, fully aware that their lower return in early years would be followed by an ever-increasing stable, and dependable income over the long term.

Phillips publishes "proved" reserves exclusively and then only to SEC registration statements, the last of which was issued in 1953. That revealed total U. S. proved net reserves of crude oil and natural gas liquids, owned or controlled, totalling 1,355,000,000 bbl and natural gas in the amount of 17.89 trillion cu ft, not including reserves in the tidelands, whose title was then clouded but since has been cleared.

Since "possible" reserves ordinarily will exceed "probable" reserves by a considerable figure, they have real value though they are intangible. Reserves under approximately 10 million acres, or over 90% of all of Phillips acreage holdings in this country, fall outside the categories of "proved" or "probable." That acreage cost a large sum of money and we have a high opinion of its future promise or we would not have acquired it in the first place, or at least would not have continued to pay retention costs. Any price tag we might attach naturally would be considerable.

Another question I have been asked is, *"What part will natural gas play in the Phillips picture over the long term?"*

The steadily mounting total income received for our gas deliveries demonstrates the effect of the ascending price scales stipulated in our gas sales contracts. Sales to outside purchasers in 1952 aggregated $37 million, last year $46 million. The estimate for this year is $58 million. The rising gross income during 1952 and 1953 resulted almost entirely from increases in prices received, as the volume from new sales was offset by reducing low-price gas deliveries to channel carbon black plants, which type of sale in 1939 comprised 77% of our total deliveries compared to only 3% in 1953.

The policy of consuming our own gas in company operations instead of purchasing from gas distributors has resulted in an internal consumption of over 600 MMcf per day out of the total 2½ billion cu ft which it is estimated Phillips will market as a daily average this year. The cost of this company-consumed gas at current field prices, of course, would be very great. Typical of this policy is the construction last year of a 30-mile pipeline connecting the company's extensive gas reserves in the Chocolate Bayou field to our chemical installations along the Houston Ship Channel.

The complexities of natural gas are greatly misunderstood by many consumers and writers, as well as by some officials and lawmakers from predominantly consuming areas. Federal regulation of producers and gatherers, contrary to common opinion, would jeopardize the consumer's gas supply and eventually raise his price.

Gas is the least part of a consumer's bill, sometimes less than 5%. In the New York area in 1952, the average

household consumer paid about $2.40 for a thousand cubic feet of natural gas. The natural gas was sold at the city gates to the local distributing companies for 26½ cents after having been transported approximately 1400 miles from the field where it had been sold to the pipeline company for 7 cents a thousand. You can visualize how little a New Yorker's gas bill might have been reduced even had the producer contributed the gas free of charge after making his investment in wells, gathering systems, purifying plants, and other facilities, and then supported their operations.

Assuming the continuation of standards heretofore adopted by the Federal Power Commission, regulation would mean permission to earn a specified rate of return, perhaps 6½%, on a determination of the applicable investment. It would require that a government bureau make literally hundreds of arbitrary assumptions to segregate facilities and operating costs between crude oil, natural gas, and natural gas liquids. Under regulation, necessary exploration for additional gas to reinforce the future of existing pipelines would be discouraged and retarded, for who would desire to risk his savings on the one chance out of nine that any sort of an oil or gas field might be found by drilling an exploratory well, particularly when this one possible lucky strike would have to pay for all nine efforts.

The mere threat of regulation already has diverted natural gas reserves from interstate markets into the tremendously expanding markets being developed within the producing states. The great new industrial empire being built on gas for power, fuel, and raw material in the gas producing states already is consuming tremendous quantities of natural gas. One aluminum plant and one large chemical enterprise in Texas now provide a larger market for natural gas than do all the homes in Detroit, Milwaukee, and Kansas City, Mo., which localities are pressing the crusade for federal regulation.

Already a number of things have been mentioned as consequences, such as: (1) Legislation clarifying the intent of Congress; (2) Unwillingness of producers to enter into sales contracts with interstate pipelines; (3) Producer sales of lower cost gas to non-regulated intrastate markets and higher cost gas to regulated interstate markets; and (4) Disposition of gas properties or of gas reserves in place.

Pipeline Communications and Electronics

By FRANK CHAPMAN

The application of electronic computers to industry operations

Frank Chapman

THE place of the electronic digital computer in the future of the gas industry was emphasized recently by Dr. Ronald L. McFarlan, of the Raytheon Manufacturing Co., in a talk before the annual business conference of the New England Gas Association. He showed how the same equipment presently used for the remote control of hypothetical pilotless aircraft may be applied to business accounting systems.

In an industry-wide application he indicated the eventual use of electronic computing equipment as combined with the industry's communications facilities to serve an untold number of operating functions. He pointed out that the power and effectiveness of computer-developed information can be amplified enormously if input data can be gathered from remote locations, transmitted to electronic computing equipment, are processed to obtain control information, and the control information transmitted along with instructions based thereon to remote locations where control is desired.

This is another, and typical, example of what has come to be known as "automation" as it is applied to the gas industry's operating functions. It is a process that is developing slowly but definitely, and one that will eventually become a part of every department.

In establishing a background for his statements as to the future application of electronic computers in the industry, Dr. McFarlan pointed out that a computer is simply a device for making mathematical calculations. Desk type calculators are digital computers that have served an important function in the industry for many years.

However, as Dr. McFarlan pointed out, desk type calculators as well as other electromechanical business machines are comparatively slow in their operation. The electrically produced motions of the individual rods, levers, cams, and relays require too much time to accomplish, and drastically limit the ultimately attainable computing speeds.

Conversion of the ordinary decimal number system, such as that used in conventional desk type computers, to a binary system, such as used in electronic computers, was described by Dr. McFarlan. He showed how binary numbers may be added, subtracted, multiplied, and divided just as easily as decimal numbers. Although requiring more digits to express a single number, binary numbers are more readily adaptable to electronic computing than decimal numbers.

Operating problems, such as those handled by gas industry operating people, must be reduced to mathematical terms before they may be applied to any type of digital computing equipment. Dr. McFarlan pointed out that this may be done just as long as "we can understand and detect all the variables involved, and if we can assemble enough data to relate these variables to each other." Many of these equations are extremely complex and cannot be solved practically in reasonable time except by the use of a high speed electronic computer.

As a typical example of a problem that might be attacked by the electronic computer, Dr. McFarlan chose weather forecasting. No choice could be more typical of the kind of problem to which the gas industry might best apply the combined techniques of electronic computers and communication.

He said that although most of the factors affecting the weather and the

J&L pipe and progress

Today's tremendous demand for the conveniences of gas gives new significance to the role of J&L pipe in gas industry progress.

A major producer of the drill pipe, casing, and tubing used in the recovery of gas from underground, J&L also furnishes the industry with other important tubular products... standard pipe and line pipe.

These dependable steel arteries carry gas from wells to cleaners, dryers and collection stations in the field. And in consuming areas they provide the complex distribution networks that bring the gas right to the burners in home and factory.

Extensive research, rigid testing and complete control of every step in production enable J&L to supply the safety-minded gas industry with tubular products of the highest serviceability.

The performance of J&L pipe is typical of how J&L steel and steel products measure up to the most important test ...service on the job.

J&L PIPE

J&L STEEL

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STEEL CORPORATION — *Pittsburgh*

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equations relating them are now known, the number of these factors—pressure, temperature, velocity, etc.—is so large, and the mathematical equations connecting them so complex that practical mathematical solutions in sufficient time to be of value have not thus far been possible. However, through the application of electronic digital computers the picture has changed and present-day machines are capable of handling problems of this magnitude.

The application of electronic digital computers to business system operations indicates, in a sense, the manner in which the same type equipment may be applied to weather forecasting and other gas company operating problems, including data processing and the remote control of system elements.

The problem of the payroll department in a large corporation was cited as an example by Dr. McFarlan. One task of such a department is to record the labor charge, nature of work and hours worked by each employee. In applying the electronic digital computer to this problem, the input data—labor charges, etc.—would be hand-transcribed to punched paper tape by a transcribing unit that resembles a typewriter. The punched paper tape would then be fed into a machine that automatically records the input tape on magnetic tape at the rate of 250,000 labor charges per 12-in. reel.

Once prepared, only minor changes are needed on the magnetic tape to permit its use week after week. The magnetic tape then actuates an electronic digital computer that automatically sorts the input data at the rate of 30,000 items per minute, or 50 times the maximum speed of punch card sorting. The computer automatically computes gross pay, federal old age tax, withholding tax, pension deductions, portion of gross pay subject to state unemployment tax, payroll deductions and annual total of hours, earnings taxes and deductions.

The machine automatically arranges this data on an output tape for printing payroll checks and records. Pay checks for employees, a check register, deduction lists, federal and state wage reports, and labor distribution reports are all produced in this process.

Techniques used in the guidance and control of a pilotless airplane are even more closely related, because of the remote transmission required, to the future use of a combined system of computer and communications in gas system operations. As Dr. McFarlan points out, in the control of a pilotless airplane it is necessary to know such quantities as speed, altitude, rate of climb, fuel quantity, etc. These quantities are measured by appropriate sensing instruments, converted into a single kind of quantity—electric currents in this instance—reconverted into coded signals describing these currents and radioed to a ground control station.

At the ground control station these signals, representing the remotely transmitted information about the airplane, are fed into an electronic computer. The computer makes the necessary calculations to provide the desired control information, and compares the actual airplane performance with the desired performance. Any difference between the actual and desired performance is converted automatically into instructions in the form of coded signals, which are communicated by radio back to the airplane where the necessary changes in the airplane control equipment are automatically actuated.

This entire operation might well be removed from the field of aeronautics and placed in the field of gas industry operations. As Dr. McFarlan pointed out, to exert stable automatic control at remote locations requires the transmission of error information and corrective instructions to the remote location. For example, it may be necessary to control valves and regulators at a remote point along a transmission or distribution pipeline. This is a job that can only be done by means of an adequate communications system including the proper electronic equipment at either end. The actual transmission of information can be by land line, radio link or microwave. The processing of information will be handled by an electronic computer.

RCA issues microwave bulletins

"Building block" equipment units and junction station assemblies for RCA's CW-20 microwave radio relay communications systems are described in two sets of 10 catalog sheets each that have recently been issued by the Engineering Products Division of the Radio Corporation of America. The new literature also explains by text and illustration the inter-relationship of these standard equipment units.

The catalog sheets in the "building block" set describe the following RCA standard units for microwave station assemblies of all types: transmitter, receiver, modulator, terminal AFC (automatic frequency control), baseband unit, power supply, terminal and repeater switching units, service channel bridging unit, baseband bridging unit and dehydrator. They are specified as numbers C.5061-66 inclusive, C.5070, C.5073, C.5074 and C.7134.

The repeater station junction assemblies are described in catalog sheet numbers C.5130-31-34-35-50-51-54-55-74-75.

In addition to the above, a series of catalog sheets have been issued by RCA on its microwave transmission line and accessories. This literature describes transmission line elbows, single and dual hangers, supporting brackets and various other miscellaneous equipment asociated with both 7/8-in. and 1⅝-in. transmission line. Numbers for these catalog sheets are C.7040-42-43-44-45-52-53-54 and C.7102-12-13-22-25-26.

All catalog sheets are available from Engineering Products Division, Radio Corporation of America, Camden 2, N. J.

Bendix announces new mobile unit

Bendix Radio recently announced a new self-contained, mobile communications unit known as the Trafficmaster that operates in the frequency range from 25 to 50 megacycles. The unit consists of a separate transmitter, receiver and power supply mounted in a single housing. The unit is specifically designed for moblie radio service and can be mounted in relatively inaccessible locations.

The unit features specially designed heavy duty, high efficiency vibrator power supplies, stacked selenium rectifiers and strip construction of individual chassis. It will also provide for dual channel operation if desired.

Recent frequency allocations

Algonquin Gas Transmission Co., Boston, for one base station at Amwell township, N. J. on 49.02 mc.

Northern Natural Gas Co., Omaha, for one base station at Ashland, Kan., on 33.18 mc.

Home Gas Co., Pittsburgh, for one base station at Lumberland, N. Y., on 33.38 mc; one fixed control at Sparrowbush, N. Y., on 456.55 mc.; and one fixed relay at Lumbertown, on 451.55 mc.

Gulf Interstate Gas Co., Houston, for one base station near Hampshire, Tenn., on 48.72 mc.

Oklahoma Natural Gas Co., Tulsa, for one base station in Oklahoma on 48.78 mc.

Southern Natural Gas Co., Birmingham, Ala., for one base station at Rome, Ga., on 49.06 mc.

United Gas Pipe Line Co., Shreveport, La., for one base station at Katy, Texas, on 48.78 mc.

Southern Natural Gas Co., Birmingham, Ala., for one base station at Brownsville on 49.06 mc.

Maintaining peak compressor efficiency — at compressor end

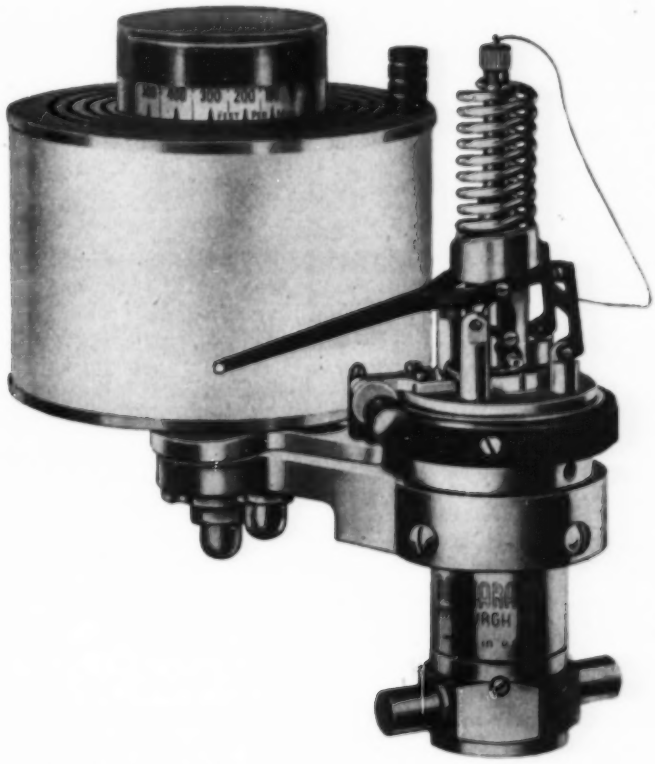
By EARL Y. PALMER, Plant Superintendent
Atlantic Refining Co., Lovington, N. M.

ONE of the most costly phases of compressor operation is maintaining peak efficiency in the compressor cylinder. A good many compressor operators fail to make use of some of the simple devices and methods of easily maintaining a compressor cylinder in first-class operating condition at a very nominal cost and little loss of horsepower due to downtime and faulty compressor cylinder parts.

Most operators maintain scheduled visual compressor cylinder inspections. A large percentage of these visual inspections turn out to have been entirely unnecessary at the time the inspection was made.

An instrument is available commercially that can be used to indicate when a visual inspection is necessary, and just what to look for during the inspection. An indication of pending compressor failure may often be obtained a considerable time ahead of actual failure. When such an indication is obtained, the operator may make plans for repairs to fit in with his working and operating schedules, thus saving prolonged downtime obviating payment of premium wages for unexpected repairs.

Most operators are familiar with the pressure-engine-indicator card instruments used for taking pressure-volume diagrams. These diagrams are used in making engineering calculations for determining mean effective pressure and indicated horsepower. This type of instrument requires an indicator reducing motion, which is not easily arranged for on modern compressor units; thus an operator would be required to rely on a pullcard mechanism, which is quite unhandy and inaccurate when operated by hand.



The Bacharach Chronomatic engine indicator eliminates the need of an indicating reducing motion.

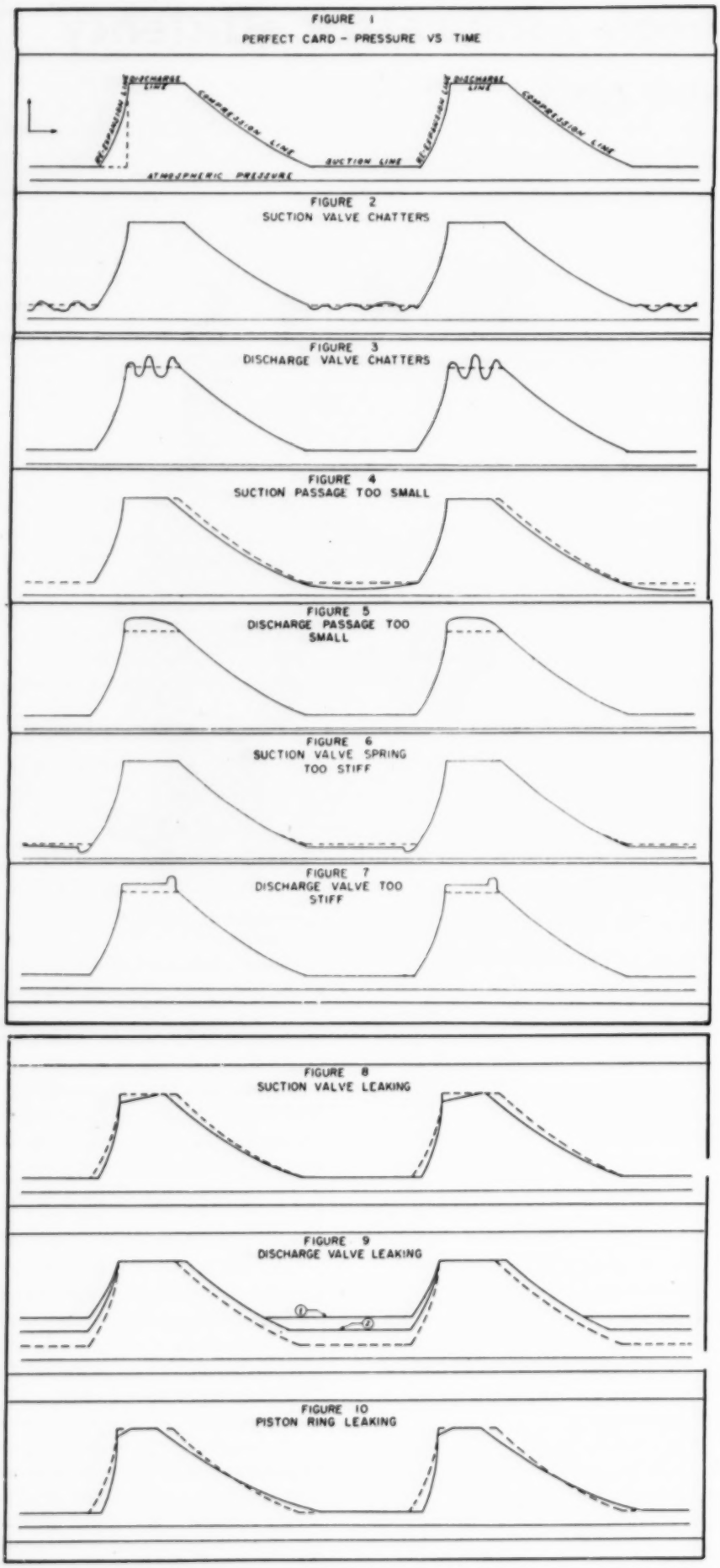
The type 2-caps Bacharach chronomatic engine indicator, which eliminates the need of an indicating reducing motion, is shown in the picture. This chronomatic engine indicator, in addition to being used for engineering purposes, is ideal for taking a pressure-time indicator card, which can readily be used to show the interior condition of a compressor cylinder for maintenance purposes.

The pressure record of the indicator is made on a removable chart that is wraped around the chronomatic drum. The chronomatic drum operation is quite simple and requires no skill or special training. The drum is free rotating and receives propulsions from a helical spring encircling the drum shaft. The drum is designed so that a sit continues to spin, a uniform speed is obtained for sufficient time to produce a diagram with a constant time scale. The drum surface speed, in feet per minute, at any instant is indicated by the speed indicator on top of the drum.

The pressure-time diagram shows the change of cylinder pressure on a time basis. As the chronomatic drum surface speed, read in feet per minute, can be adjusted over a broad range, the pressure record may spread out on the chart over as much space as needed to obtain a clear picture of any portion of the compressor cycle to be studied.

To use the chronomatic engine indicator diagram for compressor cylinder maintenance purposes, a set of pressure time indicator cards has been developed to help the operator interpret the indicator card that may be taken in the actual operation of a compressor cylinder without any linkage with the engine. The

Mr. Palmer, who is at present plant superintendent for the Atlantic Refining Co. at Lovington, N. M., studied petroleum engineering at the Colorado School of Mines. Prior to joining Atlantic, he spent several years in oil production, gasoline and chemical plant management and operation.



Figs. 1-10. A set of pressure-time indicator cards showing various conditions that may be encountered.

guide indicator cards are shown in *Figs. 1—10.*

Fig. 1 shows a perfect card, indicating that the compressor cylinder is in good operating condition. Note that by drawing a perpendicular line from the left side of the discharge line to the horizontal extension of the suction line, and folding to the right on the perpendicular line, a pressure-volume diagram may be created.

Fig. 2 indicates that a suction valve chatters. This is probably because of weak valve springs and may result in a broken valve plate or a leaky valve.

Fig. 3 shows weak springs in the discharge valves, which will result in a broken valve plate or a leaky valve, which, in turn will result in cylinder heating and loss of horsepower.

Figs 4 and *5* indicate that the suction and discharge passages are too small. Too small a valve lift could also be indicated.

Figs. 6 and *7* show that the valve springs may be too stiff. This means a loss of horsepower. Valve springs of the proper tension should be installed.

Fig. 8 shows a typical suction valve leak. The leak may be either in the valve or valve gasket.

Fig. 9 indicates a badly leaking discharge valve (Curve 1) and a slightly leaking dischare valve (Curve 2). The leak may be in the valve or its gasket.

Fig. 10 shows what may be indicated by the compressor piston rings leaking. Leaky piston rings may be due to worn rings, out-of-round compressor cylinders, or weak expander rings used with plastic type piston rings.

An operator who intends to use an indicator card mechanism for determining when and what to do in the way of compressor cylinder maintenance should establish a guide library for all of his own particular compressor cylinders by obtaining perfect cards when his cylinders are in good condition, and by taking indicator cards on some of his own bad cylinder conditions. In this way an operator will readily become familiar with his own equipment.

In order to attach the engine indicator to a compressor cylinder, it will be necessary to equip both the head and crank ends of the compressor cylinder with a good valve. Normally, less than five minutes is required to take each card. Diagrams of both the head and crank ends are normally taken on the same card.

This article is adapted from a talk presented at the NGAA convention held in Dallas, April 21-23.

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PIPELINE NEWS

FPC has jurisdiction over independents

(Continued from Pipeline Cover)

panies was the primary aim of the Natural Gas Act. Attempts to weaken this protection by amendatory legislation exempting independent natural gas producers from federal regulation have repeatedly failed, and we refuse to achieve the same result by a strained interpretation of the existing statutory language."

The five voting in the majority were Justices Minton, who wrote the opinion, Chief Justice Warren, and Justices Black, Reed and Frankfurter, the latter writing a separate concurring opinion.

Beside the dissent of Justices Clark and Burton, a separate dissent was written by Justice Douglas. Justice Jackson took no part in the consideration or decision.

The majority said that it was of the opinion that "production and gathering, in the sense that those terms are used in Sec. 1 (b) (of the Natural Gas Act), end before the sales by Phillips (to the interstate pipeline companies) end," and noted that in its decision in the Panhandle case the court had observed that the "natural and clear meaning" of the phrase "production and gathering of natural gas" was that it encompasses "the producing properties and gathering facilities of a natural gas company." It also asserted that in various other cases it had held that the Sec. 1 (b) exemption applies merely to the physical activities, facilities and properties used in the production and gathering of natural gas.

The majority devoted a considerable portion of its opinion to making a fuller explanation of what it had said in the Interstate Natural case, stating that in that case the court had based its decision "on the broader ground that sales in interstate commerce for resale by producers to interstate pipeline companies do not come within the 'production and gathering' exemption."

It said that the various cases to which it had referred "supply a ready answer to the determination of the (Federal Power) Commission and also to petitioners' suggestion that 'production and gathering' should be construed to mean the 'business' of production and gathering, with the sale of the product considered as an integral part of such 'business.' We see no reason to depart from our previous decision, especially since they are consistent with the language and legislative history of the Natural Gas Act."

"In general," said the majority, "petitioners contend that Congress intended to regulate only the interstate pipeline companies since certain alleged excesses of those companies were the evil which brought about the legislation. If such were the case, we have difficulty in perceiving why the commission's jurisdiction over the transportation *or* sale for resale in interstate commerce of natural gas is granted in the disjunctive. It would have sufficed to give the commission jurisdiction over only those natural gas companies that engage in 'transportation' or 'transportation *and* sale for resale' in interstate commerce, if only interstate pipeline companies were intended to be covered.

"Rather, we believe that the legislative history indicates a congressional intent to give the commission jurisdiction over the rates of all wholesales of natural gas in interstate commerce, whether by a pipeline company or not and whether occurring before, during, or after transmission by an interstate pipeline company."

Distinguishing between this case and those in which the court approved minimum field prices set by the states as conservation measures, the majority commented that the FPC did not participate in the latter, the issue of possible conflict with federal authority under the Natural Gas Act was not raised, "and consequently we expressly refused to consider at that time 'whether the Gas Act authorizes the power commission to set field prices on sales by independent producers, or leaves that function to the states . . .'"

In his concurring opinion, Justice Frankfurter sought to emphasize that in his opinion Congress, in writing the Natural Gas Act, sought to give the FPC rate jurisdiction over all sales made in interstate commerce which are outside the jurisdiction of the consuming states.

Justices Clark and Burton, in dissent, said that "perhaps Congress should have included control over the production and gathering of natural gas among the powers it gave the Federal Power Commission in the Natural Gas Act, but this Congress did not do." They noted that, on the contrary Congress provided that the act should not apply to production and gathering, adding that the exemptive language "could not express a clearer command, but the majority renders this language almost entirely nugatory by holding that the rates charged by a wholly independent producer and gatherer may be regulated by the Federal Power Commission." The Clark-Burton dissent then noted how sweeping the majority opinion is, saying it brings under regulation all producers whose gas gets into interstate commerce, and declared this to be contrary to Congressional intent and thrusts the FPC into the regulator domain traditionally reserved to the states.

Further, the dissent, commenting that Phillips' operations are confined exclusively to production and gathering, related how the legislative history of the Natural Gas Act clearly shows that Phillips' sales were meant to be exempt from FPC regulation. Congress, the justices said, aimed only at abuses resulting in the "gap" at the end of the transmission process by integrated and unintegrated pipelines and not at abuses prior to transmission.

"By today's decision, the Court restricts the phrase 'production and gathering' to 'the physical activities, facilities, and properties,' used in production and gathering," the Clark-Burton dissent said, adding that "Such a gloss strips the words of their substance . . .

"There can be no doubt, as the commission has found, that federal regulation of production and gathering will collide and substantially interfere with and hinder the enforcement of these state regulatory measures. We cannot square this result with the House Report on this act which states that the subsequently enacted bill 'is so drawn as to complement and in no manner usurp state regulatory authority.'"

The dissent contended that the Interstate case "involved a materially different fact situation," noting that that company had successfully resisted state attempts to regulate, and that Interstate obtained substantial gas from others who had produced and gathered it.

Justice Douglas, who filed a separate dissent asserted that regulating the price at which the independent producer can sell his gas regulates his business in the most vital way any business can be regulated. That regulation largely nullifies the exemption granted by Congress (in Sec. 1 (b)).

He said that the history and language of the act are against the contention that Congress meant the FPC to have jurisdiction over rates charged by independent producers.

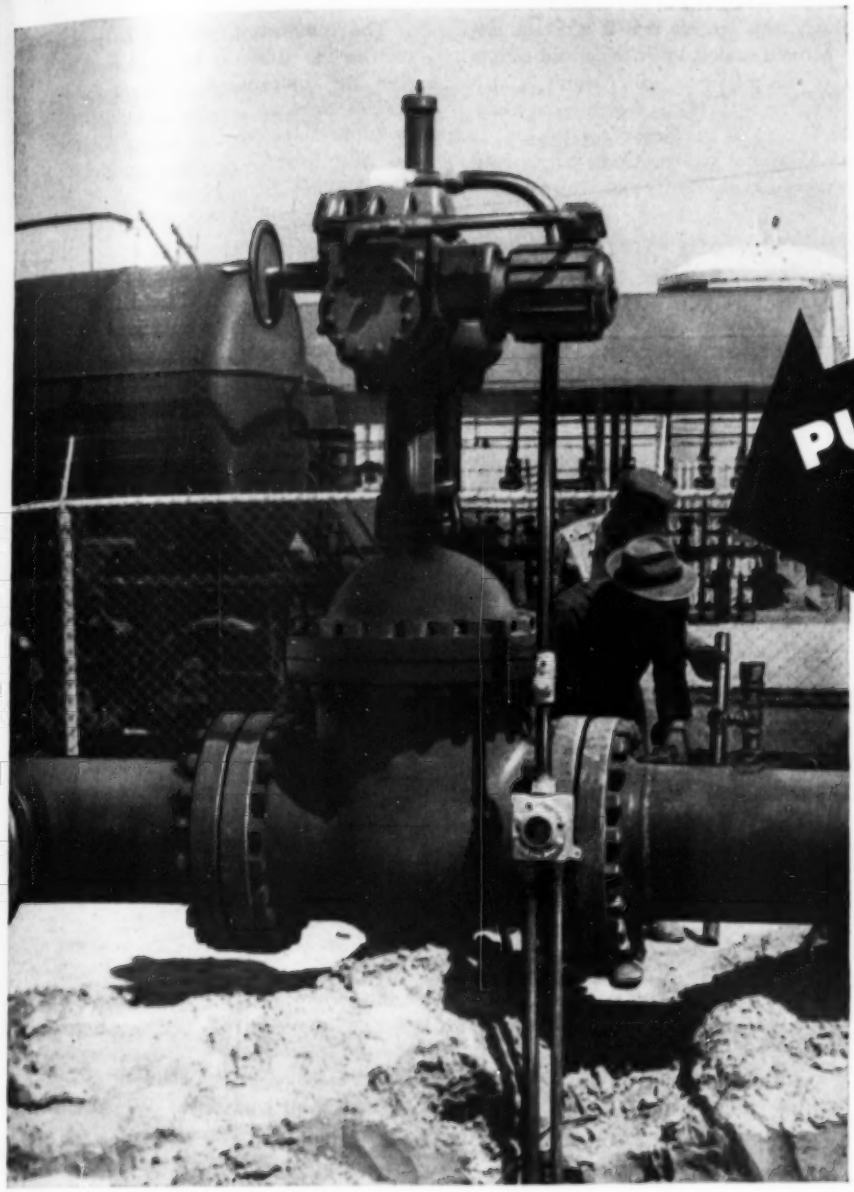
"If that ground is to be taken," he said, "the battle should be won in Congress, not here. Regulation of the business of producing and gathering natural gas involves considerations of which we know little and with which we are not competent to deal."

The "Wall Street Journal" pointed out what it considers a possible result if the court's thinking were carried to its logical extreme. The Journal said that since "'protection of consumers against exploitation' is the primary aim of the regulatory act, according to the decision, it therefore follows that the Government can regulate the independent, intra-state company as well.

"This dictum makes an interesting doctrine. If it were applied with any consistency, it could put a lot of other industries under control of the Federal price fixer through the guise of utility regulation.

"Many gas utilities, for example, manufacture their own gas from coal rather than buying it from wells; many others mix the manufactured and natural gas in varying proportions. But whether it is manufactured or mixed gas, it is plain that the price of coal becomes a major ingredient in determining the cost of the commercial gas.

"Or applying the language of the court to coal, 'The rates charged may have a direct and substantial effect on the price paid by



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the ultimate consumers.'

"So if that is to be a criterion, it is immediately arguable that the coal industry ought to be under Federal regulation, at least to the extent of having the Government fix the price it can sell to an interstate gas company. Why should natural gas consumers be 'protected' while consumers of coal-made gas are subject to price fluctuations in the coal market?

"For that matter, why should the electric utilities be left out? Many of these make their electricity from coal-fired generators, and the price of coal certainly has a 'substantial effect' on the cost of the electricity.

"Without carrying this doctrine to any absurdity, you can see that if a commodity is to become subject to price control simply because it is used by a utility which is itself regulated, a wonderful new area of regulation is opened up. Utility companies buy a wide variety of goods that affect their costs and the price the consumer has to pay."

North Dakota commission approves pipeline plan

Conditional approval to North Dakota Natural Gas Transmission Co.'s application to build a $10.7 million, 470-mile pipeline across North Dakota was given by the State Public Service Commission.

The commission pointed out, however, that for the project to be economically feasible, the company would have to provide interruptible gas service to industrial users at points along the line when domestic demands drop in the summer months.

Under the plan, North Dakota Natural would purchase 25 MMcf of gas per day from Amerada Petroleum at a price ranging from 13 cents per Mcf the first year to 19 cents in 1970. The PSC held that the proposed line would have sufficient capacity to adequately serve the estimated daily market requirements for the first three years of operation.

The PSC said: "This commission will exercise its jurisdiction to compel such additions as are in the future shown to be economically feasible, provided adequate supplies of gas are available."

As one of the conditions under which it approved the application, the commission held that gas service must be provided at Tioga, western terminus of the pipeline. Service to Tioga had been proposed by the firm as a later development.

The commission provided specifications which must be met by North Dakota Natural within the next 30 days for the order to go into effect:

Amerada Petroleum must be committed to complete wells on or before Sept. 30, 1956, capable of producing 30 MMcf of recoverable pipeline gas per day.

North Dakota Natural's contract with Amerada must be modified to provide that the transmission firm shall have the right to buy additional quantities of gas in excess of the 25 MMcf per day if available; but that North Dakota Natural shall not be required to buy gas in excess of the daily amount and above the market demand.

North Dakota Natural must file a written commitment with the commission to make a geological investigation of underground storage facilities adjacent to the pipeline before July 1, 1956.

The firm must produce certified copies of gas contracts between itself and industrial gas consumers.

Transco to allocate nearly 16.5 MMcf on firm basis

The Federal Power Commission has issued an order allocating 16,473,000 cu ft of natural gas per day on a permanent firm basis from the transmission system of Transcontinental Gas Pipe Line Corp., Houston. In addition, 2.9 MMcf were reallocated on a firm basis, making a total of 19,373,000 cu ft disposed of by the order.

The order related principally to 16,953,000 cu ft of natural gas, the permanent allocation of which was reserved for future determination in an FPC order issued last December. At that time the commission allocated on a permanent firm basis a total of 47,047,000 cu ft per day, and allocated the 16,953,000 cu ft on a temporary firm basis

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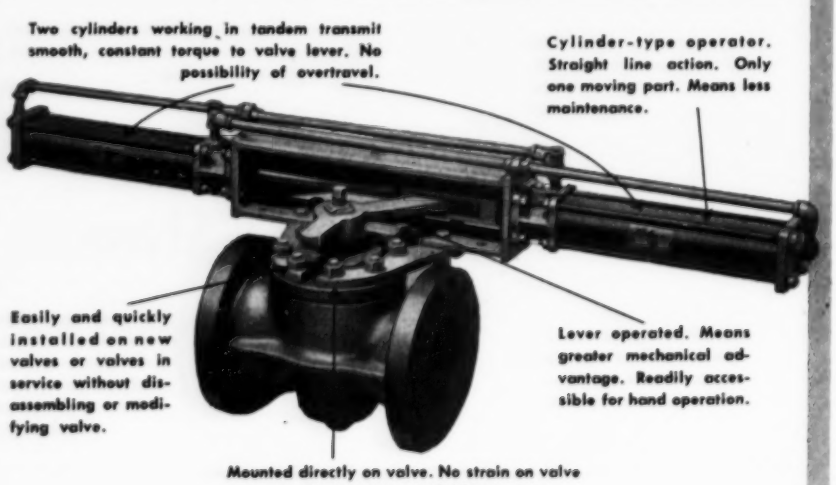
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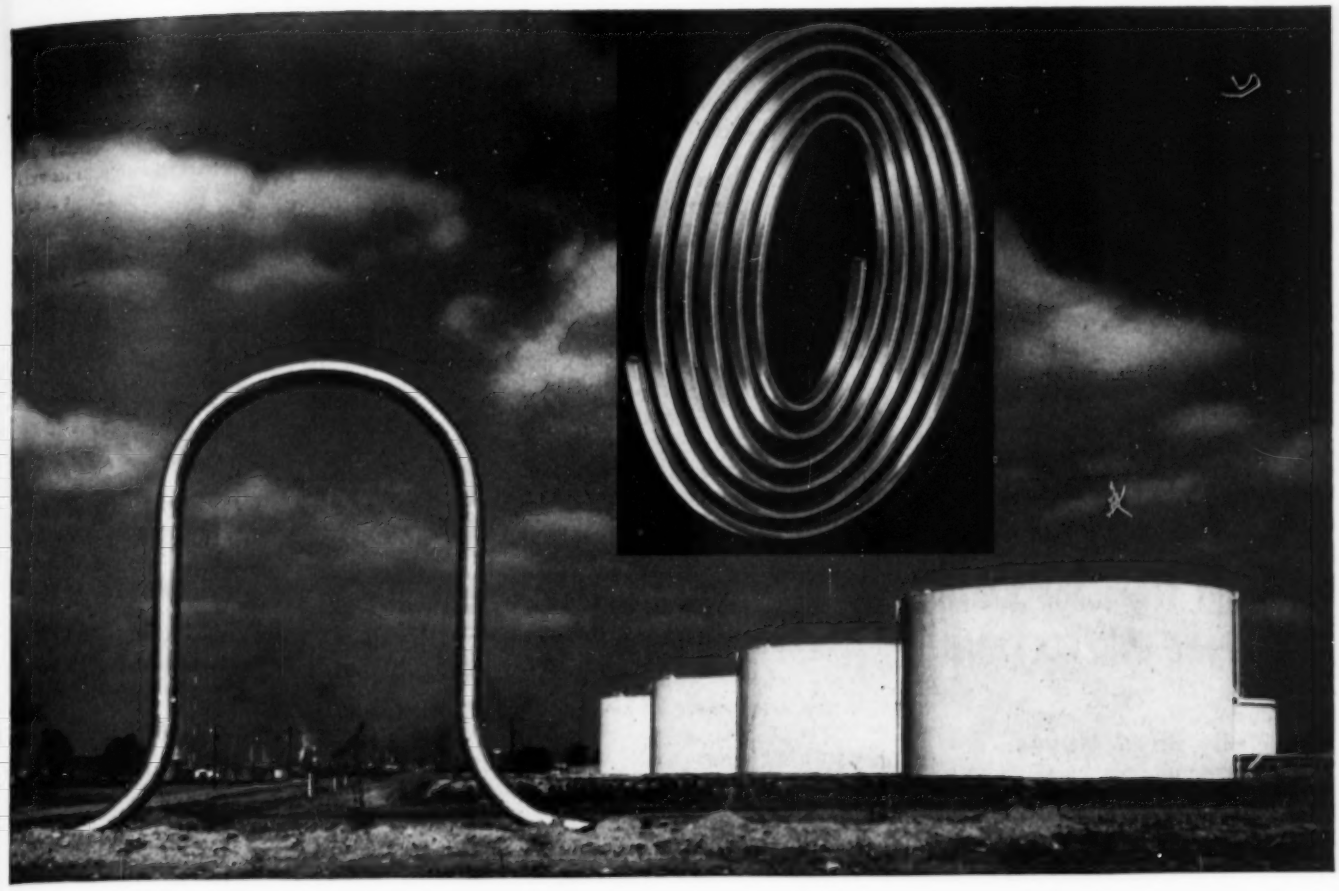

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HOT DOPE

Straight from the Kettle on PIPE PROTECTION

★

By Boyd Mayes

● Got strung out in a confab with a friend the other day about saving money. Saving's an interesting subject to us, because that's our business since our job is saving pipe by giving it the "forever" treatment before it goes in the ground. An old darkey named Uncle George Washington Jones up in the Piney Woods used to have a funny slant on saving. He lived in a tumbled down shack and raised corn for a living. He had a hound dog, a shot gun, a good disposition and a wide reputation for shooting crows. But he didn't call it that. He called it his *savings bank*. He figured each crow ate a hundred dollars worth of corn in a season, and lived to eat ten seasons of his corn if let be. So, every time he shot a crow he marked up a one thousand dollar "deposit" on his rickity shed. No telling what Uncle George Washington Jones' balance was last time we heard of him, but he must have considered himself pretty rich. Maybe the old fellow had something. Come to think of it, if we had all the money we'd saved the pipe line industry by *putting permanence in pipe* that moves crude oil, natural gas, and finished products from here to there we'd make Uncle George Washington Jones look like a crop failure.

MAYES BROS.

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pending further hearings, which commenced Feb. 8 and were concluded March 4.

In its December 11 order the FPC said that if showings were made by interveners that their projects were economically or financially feasible, it would allocate the 16,953,000 cu ft of gas to them on a permanent firm basis.

Gas price-fixing bill rejected in Louisiana

A bill to authorize the Louisiana Conservation Commission to fix minimum wellhead prices on natural gas was unfavorably reported to the Louisiana House of Representatives by its conservation committee.

Opponents said the bill would set a precedent of legislative action breaking private contracts and would have an adverse effect on industries contemplating moving to Louisiana.

Proponents argued that serious inequities exist in the sale of natural gas because different prices are paid for the same gas to multiple royalty owners and that if Louisiana does not institute its own system of price controls, the federal government will move in with a regulatory program.

Pipe wrapping and cleaning done in one operation

Heating, cleaning, priming, coating, wrapping, end-cleaning, and white-washing of pipe in one continuous automatic operation is being done in a permanent yard set up by Crutcher-Rolfs-Cummings on the Houston (Texas) ship channel.

The unit has been handling 20-in., 40-ft joints, which feed through at the rate of 80 ft per minute, or six miles per day. A series of inclined racks and roller drives are utilized to move the pipe through the yard equipment. Pipe is unloaded on to a rack, which feeds it into the cleaning machine. Then it moves on to the coating and wrapping machine. A water spray bath cools the joint after it leaves the coating and wrapping machine so that it may be handled easily, and a holiday detector marks holidays with aluminum paint so that they can be spotted quickly.

At this point, automobile wheels and tires are used to support the pipe in its axial movement. After the pipe is cooled it is sent on to another rack where two end cleaners move into position to clean 5 in. on either end of the pipe and bevel the edge for coating. In the final step, the joint passes through a whitewashing machine, which coats it to offset the effects of the sun's rays.

Aztec Oil now operates as independent company

Aztec Oil & Gas Co. is now operating independently of its former owner, Southern Union Gas Co., Dallas, according to a joint announcement issued by Wofford Cain, president of Azetc and James C. Reid, executive vice president of Southern Union.

Southern Union divested itself of all ownership interest in its formerly wholly-owned drilling and producing subsidiary, Aztec Oil, earlier this year. However, it was operated by the parent company under an inertia service agreement until May 1.

Van Thompson is executive vice president of Aztec Oil; Quilman B. Davis, former attorney for Southern Union, is general attorney; and E. M. Anderson, Southern Union district geologist since 1952, has been named chief geologist.

Trans-Canada line facing legal tangle in Canada

Financing of Canada's major gas lines may have to be postponed until next year. This is the prospect which faces both Trans-Canada Pipe Lines and Westcoast Trans-

This permanent yard set-up on the Houston Ship Channel heats, cleans, primes, coats, end-cleans and wraps pipe in one continuous operation.

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To save time and costs on these jobs, Fluor maintains two well-equipped pipe fabricating shops—one at Los Angeles and one at Paola, Kansas. Fluor has perfected streamlined techniques for designing and building dampening systems—has the volume production to cut manufacturing costs—possesses the necessary experience to offer a better integrated unit at a price comparable with any normal system.

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mission Co., as they look forward to getting their long-sought licenses from the Federal Board of Transport Commissioners in Ottawa, and the U. S. Federal Power Commission, respectively.

The situation arises from a defect in the federal Pipelines Act, which the government is so far unwilling to put right this session.

Another defect in the Pipelines Act amendment hastily passed last November may hinder Trans-Canada in making marketing arrangements in southwestern Ontario. It leaves the Union Gas Co. virtually in the position that Consumers' Gas Co. of Toronto held before the amendment was passed—free to expand its imports from the United States, without federal control.

Last fall the Federal Government of Canada discovered it had no authority to make good its promise that import of U. S. gas to Toronto should not be allowed to hinder completion of the all-Canadian pipeline from Alberta.

It asked Parliament to pass quickly an amendment to the Pipelines Act, which was designed specifically to give the Federal Government authority to prevent new lines being built for the import of gas from the United States.

The amendment provided that "no person" might "construct or operate" an extra-provincial pipeline "other than a person having authority under a Special Act." But it said this would not apply to the operation of a pipeline which was constructed before Oct. 1, 1953. These provisions secured the desired objective.

But the hasty amendment failed to do two things which are now showing up as obstacles in the way of the all-Canadian gasline:

1. The stipulation that no person shall "construct or operate" an extra-provincial pipeline makes no provision for the event of liquidation or receivership. The question is whether any financial house will be willing to provide the senior financing for Trans-Canada when the law expressly appears to preclude such transfer of operation.

2. The exemption of pipelines constructed before Oct. 1, 1953, leaves Union Gas free to bring in as much gas as it can get from the United States without any need for a license from the Board of Transport Commissioners or any other form of federal approval.

Trade Minister C. D. Howe has made it clear to the company, and to the U. S. company that is offering it increased supplies of gas, that his approval will depend on a similar arrangement to that which Consumers Gas has made with Trans-Canada—namely that the extra U. S. gas shall be cut off when Trans-Canada can supply Alberta gas to take its place.

Ohio Fuel announces $33 million expansion

Ohio Fuel Gas Co., Columbus, has announced that it will start shortly on the biggest distribution program in its history, requiring expenditure of an estimated $33 million to serve 70,000 new home heating customers.

Between now and Nov. 1, 1954, the Columbia Gas System affiliate will build 86 miles of 30-in. line to carry a peak load of 150 MMcf of gas daily from the Gulf Interstate line.

A. W. Lundstrum, Ohio Fuel president, said the improvement will be financed by increased sales made possible by the expansion program and that there would be no immediate rate increase. He said this will be the first time in seven years Ohio Fuel Gas will be able to deliver gas to heat all the homes on its lines.

Four Columbia affiliates file rate hikes with FPC

Four Columbia Gas System subsidiaries have filed proposed wholesale rate increases with the FPC totaling more than $21 million per year based on estimated sales for 1954.

United Fuel Gas Co., Charleston, W. Va., proposes a $13,227,000 increase; Atlantic Seaboard Corp., Charleston, $5,194,000; Central Kentucky Natural Gas Co., Charleston,

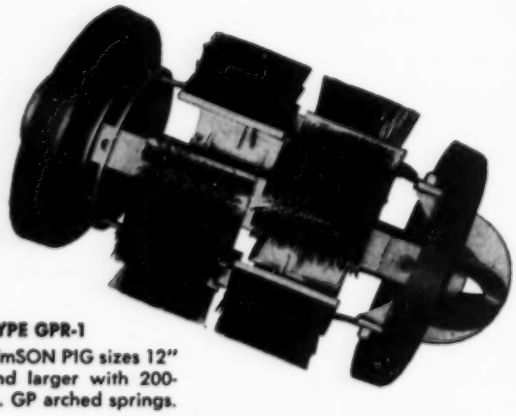
COMPACT ECONOMY IN

WEAR COMPENSATING PIGS

PROVEN BY 2 YEARS TESTING

TYPE UG-1
WmSON PIG sizes 12"-18" with 80-lb. Springs

THE ALL-PURPOSE SCRAPERS



TYPE GPR-1
WmSON PIG sizes 12" and larger with 200-lb. GP arched springs.

ECONOMICAL
low-cost construction plus long life brushes and cups

COMPACT and RUGGED
to traverse sharper bends and other restrictions

FULL PIPE COVERAGE
by overlapping arrangement of spring expanded brushes

T.D. Williamson, Inc.
THE PIG WITH THE POKE
CLEANS PIPE LINES
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"There is a Pig design for your pipe-line problem."

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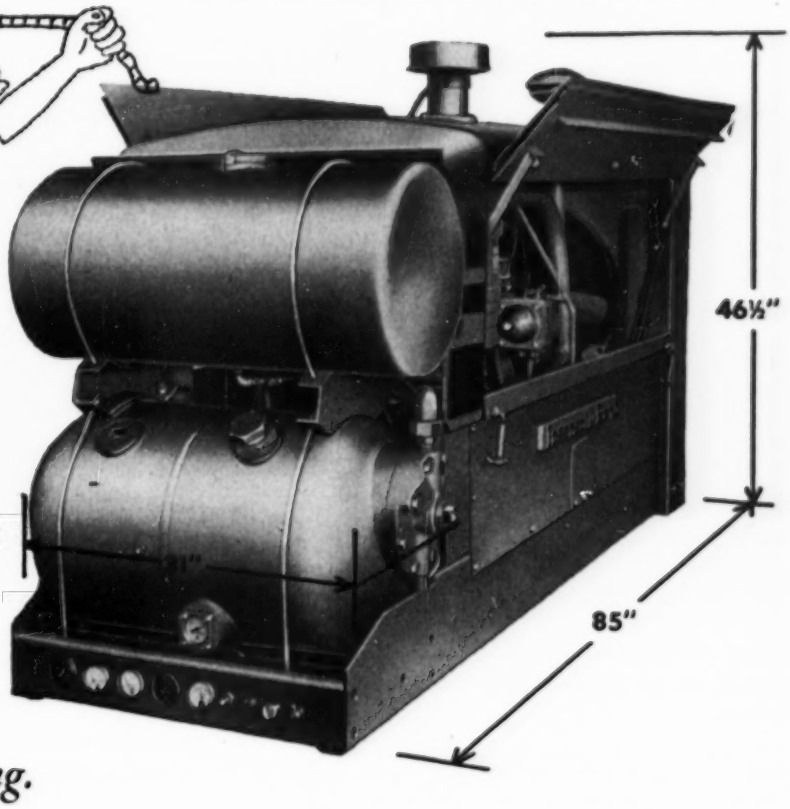
TORONTO . . . BUENOS AIRES . . . DURBAN, NATAL, SOUTH AFRICA

"Plenty of room left for tools and men too!"

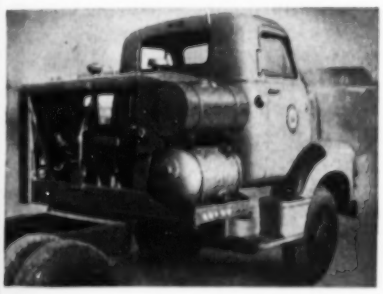


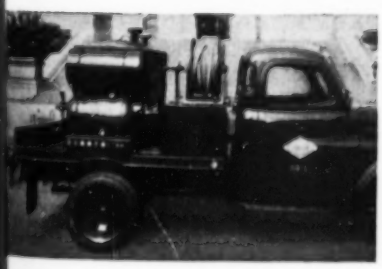
New

GYRO-FLO

ROTARY COMPRESSOR

...smallest, lightest, 125 cfm unit ever built for truck-mounting.





The self-contained GYRO-FLO 125 occupies a mere 70 cu ft of space and weighs only 2000 pounds. It is 51% smaller and 35% lighter than Ingersoll-Rand's former 105 cfm reciprocating model.

You can mount it on lighter, less costly, standard trucks for highly mobile service units. For traveling workshops, its extreme compactness allows maximum space for tools and personnel.

Only 7'1" long, this 125 compressor can easily be placed crosswise directly behind the driver's cab. It is built to conform readily to vehicle width limitations – with plenty of pipe carrying space available at the side. The control panel is conveniently located under the receiver at the curb end of the compressor.

The GYRO-FLO delivers full rated 125 cfm of compressed air at 100 psi. Having its own engine, the compressor can be removed and operated independently of truck.

- Other GYRO-FLO models include 125 and 210 cfm units on 2 wheel mounting, 210, 315 and 600 cfm on 4 wheels. GYRO-FLO's have no compressor valves to leak – no pistons, rings, rods or clutch to wear out. Discharge pressures are held between 100 and 110 psi throughout the entire capacity range of the machine. This means maximum efficiency in the operation of rock drills and air tools. And discharge temperatures are at least 100° lower than other compressors, assuring longer air-hose life.

There is a GYRO-FLO for your every portable compressor need – and your nearest I-R branch office will be glad to advise you on your particular problem.

Ingersoll-Rand

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2-29

COMPRESSORS •ROCK DRILLS •AIR TOOLS •TURBO BLOWERS •CONDENSERS •CENTRIFUGAL PUMPS •DIESEL AND GAS ENGINES

Here's How to Put Your Trenching and Lifting on a More Profitable Basis!

Mobile Bantam - Truck or Crawler Mounted Replaces Many One-Purpose Machines - Saves Money!

It will pay you to investigate the versatile Bantam Method of trenching that will cut costs. Why go to the expense of moving in big equipment, or special work crews, when hundreds of jobs like those listed at the right can now be handled faster, more economically with a job-proved Bantam. A Bantam will dig 100' of 5' trench per hour.

Costing only a fraction of the price of bigger machines, mounted on Crane Carriers, Re-manufactured Trucks and Crane Carriers, or Crawlers, Bantams' 9 quick-change front end attachments have big work capacity - for profitable year-round operation. A Bantam is ideal for scattered assignments or crowded locations where bigger, heavier machines can't go.

Write for complete specifications, information and prices. Arrange a free on-your-job demonstration. Write today!

MORE JOBS BANTAMS CAN HANDLE!

- Loading sand and gravel
- Laying mains
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- Unloading pipe and materials
- Aligning pipe and fittings
- Excavating for leak repairs
- Uncovering lines for inspection
- Backfilling trenches
- Lifts up to 12,000 lbs. (truck mounted)

T-35 Bantam on All-New Crane Carrier Lifts 12,000 Lbs.

Bantam mounts on Crane Carriers, Re-manufactured trucks or your own trucks of suitable size. Also available on tracks - Crawler Bantam features 2-speed independent travel, has 16", 24" or 32" pads to go anywhere in any ground condition.

C-35 Bantam Crawler 3/8 Cu. Yd.

SB-G-2

WORLD'S LARGEST PRODUCER OF TRUCK-CRANES AND EXCAVATORS

SCHIELD Bantam®

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ton, $2,281,000; Manufacturers Light & Heat Co., Pittsburgh, $398,000.

Shortly after the above filing, the FPC suspended, pending hearing and decision, proposed increases totaling more than $26 million for the above companies and South Jersey Gas Co., Newark. The amounts are: United Fuel, $17,542,000; Central Kentucky, $2,696,000; Atlantic Seaboard, $5,723,000; Manufacturers, $449,000; and South Jersey, $32,700.

The FPC suspended a $5,685,000 increase by Transcontinental Gas Pipe Line Corp., Houston; Hope Natural Gas Co.'s $2,175,000 increase; Tennessee Natural Gas Lines' $290,000 increase; East Tennessee Natural Gas Co.'s $650,000; and Alabama-Tennessee Natural Gas Co.'s $107,000 increase. The commission also suspended a $13,616,000 increase by Tennessee Gas Transmission Co.

Recent settlements include three rate increases involving Commonwealth Natural Gas Corp., Richmond, Va., under which the company will refund a total of $206,288 to five resale customers in Virginia. The FPC also approved a settlement of two rate proceedings involving New York State Natural Gas Corp., Pittsburgh, allowing about half the total of two proposed increases, which together, amount to about $9,260,000.

Cities Service storage near completion in Kansas

The conditioning of the former McLouth gas field, near McLouth, Kan., for underground natural gas storage purposes is nearing completion, according to word from Cities Service Gas Co. When completed, the field will be the fifth such storage reservoir developed by the company at a total cost of more than $10 million. Development of the McLouth field alone represents an investment of more than $4 million.

The company's system of storage reservoirs can be expected to deliver some 300 MMcf of gas per day, under normal winter operating conditions. To deliver the same quantity of gas from distant fields by pipeline would require the spending of about $55 million.

When in actual operation, the pipeline connecting McLouth storage to mainlines will route gas directly to Leavenworth and Atchison, Kan. and St. Joseph, Mo.

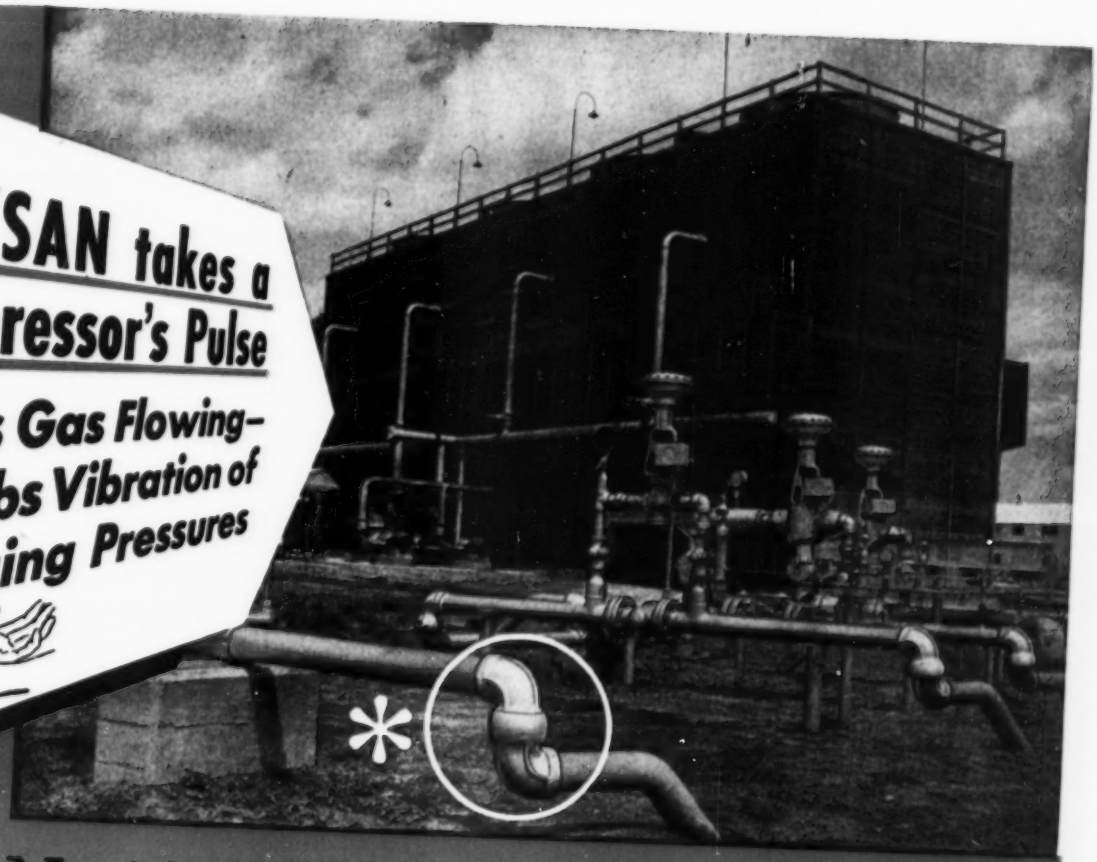
Texas Panhandle prices up 1 cent per Mcf

Producers of natural gas in the Texas Panhandle field are receiving prices averaging more than 1 cent per Mcf higher than last year, according to the Texas Railroad Commission report.

The commission reports that pipeline companies were paying an average of 8.5 cents per Mcf for gas bought at 16.4 pressure. A year ago the average was 7.

CHIKSAN takes a Compressor's Pulse

Keeps Gas Flowing— Absorbs Vibration of Changing Pressures



Not only do the stamina and flexibility of Chiksan Joints take expansion in their stride, they absorb pulsation and vibration.

When the Plymouth Oil Company wanted a better way to handle the expansion and contraction of its 2500-3500 lb. natural gas re-pressuring line in its compressor station in Sinton, Texas, back in 1946, it tried Chiksan 2-inch high pressure ball bearing swivel joints. So successful were Chiksan Joints in this application, they were adopted for 3 and 4-inch lines for the same purpose. In addition, by placing regulators, gauges and other recording equipment on a bridge using Chiksan Joints, accurate readings of the instruments could be obtained.

Since 1946, not one of these Chiksan Joints has been replaced or even repacked, and they are giving the same economical, dependable service they did when first installed.

In Texas or California — all over America and all around the world — wherever production, processing or distribution depends on the flow of liquid or gas or on the dependability of hydraulic systems, there you will find Chiksan Ball Bearing Swivel Joints on the job — adding muscle and flexibility — cutting down on shut-downs and maintenance.

Whatever your business, if gas or liquid plays a part, Chiksan's Research and Development Division can help you add efficiency, safety and economy to your operation.

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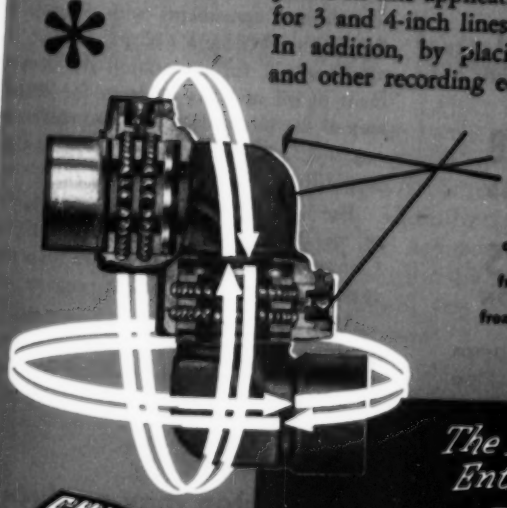
Write for Catalog 53-C, Dept. 7-G



CHIKSAN Ball Bearing Swivel Joints are THE NEW TOOL of Modern Industry — with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles and sizes have been developed for pressures and services from 28" vacuum to 15,000 psi and for temperature ranges from minus 75° to a plus 500° F. with packing materials for each specific type of service.

CHIKSAN TRADE MARK REG.

The Flow of Enterprise Relies on **CHIKSAN** *Ball-Bearing Swivel Joints*

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Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Chiksan Export Company (Subsidiary), Brea, California • Newark 2, N. J.

cents. The average for gas delivered at 14.65 lb pressure has increased from 6.69 cents to 7.66 cents during the same period.

The state-wide average price now is about 7.5 cents a thousand, according to tax statements.

Coverage cut in monthly reports from FPC

For the past several years the Federal Power Commission has issued a monthly press release showing for the current month, and for the 12-month period then ended, sales, revenues, and income of natural gas companies subject to its jurisdiction. Because of the passage into law of the Hinshaw Bill, which exempts hitherto jurisdictional companies from commission jurisdiction under certain conditions, the number of monthly reports upon which the press releases were based is to be reduced. As a result, the coverage of the data as previously presented in the monthly releases will cease to be representative of the entire natural gas industry and the issuance of the releases in their past form has therefore been discontinued.

Now data similar in form to those previously published will be issued monthly on pipeline companies only. Such classification includes, in general, companies having transmission line mileage in excess of 250 miles and sales for resale in excess of 50% of total sales. Also included are several smaller companies whose sales are almost 100% for resale and several larger companies, which, although not meeting the above criteria, have the characteristics of pipeline companies. Thirty-seven companies will be included in the series, initially.

Transcontinental seeks additional reserves

Transcontinental Gas Pipe Line Corp., Houston, has applied to the FPC for authority (Docket G-2406 and 2405) to construct about 25 miles of 12-in. laterals and a meter station in Cameron and Calcasieu parishes, La., to enable it to gain access to additional natural gas reserves in Orange, Chambers, and Jefferson counties, Texas.

At the same time, Texas Gas Pipe Line Corp., Houston, asked to build about 2.34 miles of 12-in. line, a 1600-hp compressor station, a meter station, and a check meter, to enable it to deliver the additional gas to Transco.

Transco's line will cost an estimated $1,076,000; Texas Gas Pipe, $967,179. Texas Gas Pipe Line said that it now has dedicated to the performance of its agreement with Transco reserves adequate to provide a daily contract maximum of 31.2 MMcf of gas, with an option to subsequently increase this amount.

Exploration agreement approved by Illinois CC

Peoples Production Co., a Peoples Gas Light & Coke Co. subsidiary, has entered into formal agreements with Sinclair Oil Co., Sohio Petroleum Co. and El Paso Natural Gas Co. for exploration and development of oil and gas fields in the offshore area of the tidelands adjacent to the Louisiana and Texas Gulf coast. (See June GAS, page 128.)

The agreement, made with the approval of the Peoples Gas board and the Illinois Commerce Commission, provides for a joint exploratory and development program.

Sinclair, acting for the group, was the successful bidder for a lease covering approximately 2000 acres off the shore of Louisiana. Plans are being made to start drilling at an early date.

Washington may produce some gas of its own

A new boom in gas and oil exploration in southwestern Washington is a possibility as the result of the Continental Oil Co. announcement that it has completed a 50 Mcf gas well northeast of Aberdeen.

Although this well by itself would be

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DRASTICALLY REDUCES NEED FOR DIRT PADDING
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You wouldn't think of buying steel, pumps or other similar items without seeing written specifications that tell you exactly what you're getting for your money. Then why shouldn't you buy *pipeline enamels* in exactly the same way? Why not compare enamels, specification by specification, and insist that the enamel you buy stays within those written specifications?

Published specifications of *Pitt Chem* Modified, Standard and Plasticized Enamel are available and will gladly be sent on request. Samples, too. We invite you to test the softening point, ash, penetration, and other important specifications of Pitt Chem Enamel. You'll prove to your own satisfaction that coal-to-enamel quality-control definitely does produce a true-to-specification coating that gives you better performance above ground and longer-lasting protection below.

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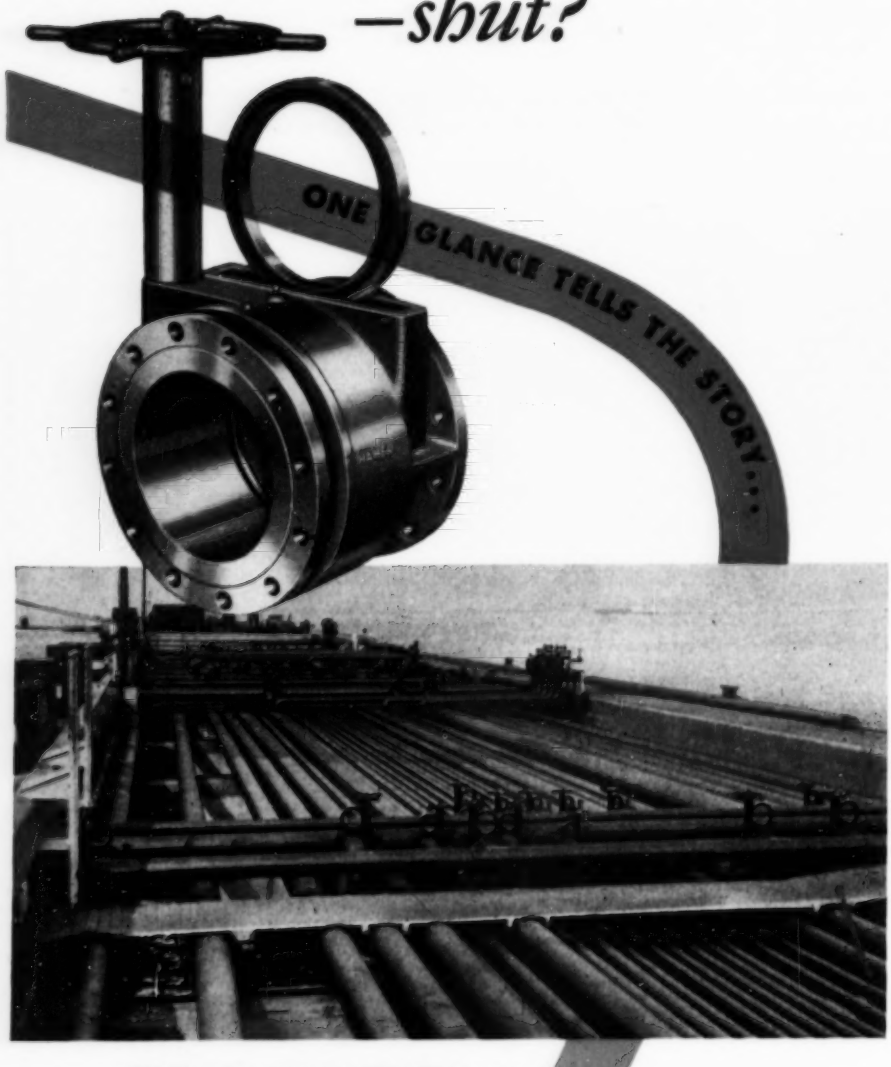
Lines open?

—shut?



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LINE BLIND VALVES

HAMER *Plug Valves*

Standard dimensions . . . easy to substitute in existing installations. There's a HAMER *non-stick* Plug Valve for any requirement.

Don't guess—With the Hamer Line Blind Valves you know instantly at a glance which lines are open and which are shut. If the open end of the spectacle plate is up, the line has a **permanent, positive shut-off** . . . blank end up indicates a round, full open line. And Hamer Line Blind Spectacle Plates are easily visible from a distance . . . no need for individual valve checking. An enclosed plate slot on the Hamer Valve eliminates product waste while spectacle plate is being reversed—stops mess, reduces fire hazard.

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"almost meaningless," according to Sheldon Glover, state supervisor of mines and geology, N. Henry Gellert, president of Seattle Gas Co., said the discovery might indicate the drilling was at the edge of a more extensive gas formation. He added that a Washington gas supply, even in relatively low volume, would be valuable to meet peak demands, supplementing gas piped into the region.

Pipeline Notes

Work is scheduled to begin immediately on a $1,540,000 pipeline that will give the Niagara Frontier an integrated gas system. The new line will join the areas served by the Iroquois Gas Corp. and the Republic Light, Heat & Power Corp. It should be finished in about three months.

Lone Star Gas Co., Dallas, has announced construction plans for a new gas gathering line in Stonewall county in west central Texas. The 8-in. line will tie into the Stonewall Gas Products Co. gasoline plant and extend eastward to a point in Haskell county, where it will connect with Lone Star's transmission system. The line will take up to 12 MMcf of gas per day from the plant.

Financing of the natural gas pipeline, which will in the first year of operation practically eliminate Pakistan's need for coal imports, will be undertaken by the International Bank for Reconstruction and Development. One of the unusual features of the $14 million loan is that it is the first made by the bank to a privately owned utility company.

Hearings were scheduled for June 29-30 on the Ferguson bill which would nullify the FPC fair field price policy for pipeline-owned gas. It would require such gas to be priced by FPC on the old rate base formula.

The FPC has reaffirmed its fair field price policy for pipeline-owned gas reserves. It denied June 4 a petition for rehearing in the Panhandle Eastern case (see May GAS, page 37). Next stop for the city of Detroit, Wayne county of Michigan, and Michigan Consolidated Gas Co. would be the U. S. Court of Appeals for the District of Columbia.

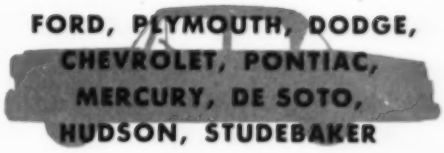
FPC Commissioner Dale Doty's term of office expired June 22. It has not been expected that he would be reappointed. An FPC member does not continue to hold office until his successor is qualified.

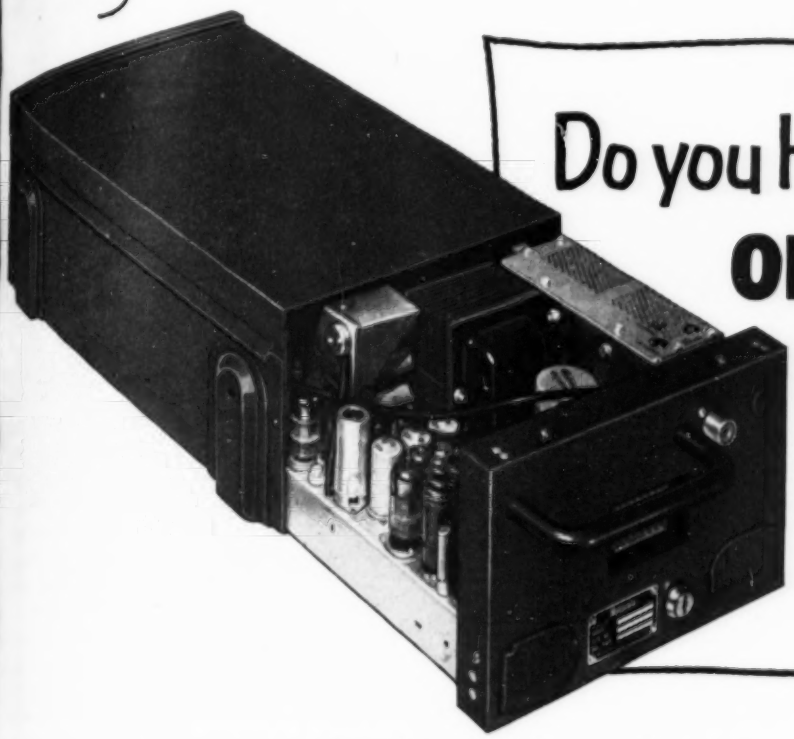
Records are being made of the hearings on S. 525, which would grant natural gas companies the right of eminent domain in securing underground storage, and S. 1291, the Hunt bill to require FPC to prohibit imports of natural gas when they would "result in economic dislocation, unemployment

12 VOLT ELECTRICAL SYSTEM

These already have it!

How many will have it by 1955-1956?





Do you have fleet radio OBSOLESCENCE INSURANCE?

Motorola

had it *built-in* a year ago

A growing number of automobile manufacturers are changing from 6 to 12 volt electrical systems. Motorola 2-way radio now gives you built-in protection against expensive obsolescence should any part of your fleet be affected by this trend.

WHAT IT IS—It's truly universal 6/12V equipment—2-way radio that can be interchanged in mixed 6 and 12-volt fleets without modification of power supplies, jumpers, plugs, connectors, cables or switches. When re-installing in a 12-volt car, no cable replacement is required. It is so fool proof that you can safely make changeovers in the dark without worry of burning out tubes or damaging a power supply.

FEATURES—The *all-vibrator* power supply attains over 70% power conversion efficiency with a resultant power drain reduction of up to 40%—for more power per unit size per ampere drain than any other sets on the market—all this, plus the superior performance of Motorola's famous Sensicon with guaranteed permanent selectivity and seven other exclusive features.

ACCEPTANCE—Again anticipating the trends, Motorola offers freedom from obsolescence, and superior performance at lower cost. You can easily see and hear the difference—greater signal strength, more audio power, longer battery and generator life, lower maintenance costs. You get all this in Motorola's truly universal 6/12-volt mobile units—available in the following classes:

- 25-54 mc., 25-30 and 50-60 watts R.F. output
- 144-174 mc., 10 and 25 watts R.F. output
- 450-470 mc., 18-20 watt R.F. output

Here is a partial list of Motorola 2-way Radio customers who have 6/12 volt interchangeable mobile units—

Michigan State Police	El Paso National Gas Co.
Ohio State Police	Boston Edison Co.
Shell Oil Co.	Florida State Police
Community Public Service Co.	Iowa State Police
County of Orange, Calif.	State of South Carolina

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HOLIDAY DETECTORS FOR DEPENDABLE DETECTION

Model 400 designed with electrode between front and rear rollers, so that holidays are detected if caused by rollers operating too close behind field c/w machines. Eight to ten pounds lighter than other detectors of similar design. Spring electrode designed to prevent detector falling off pipe, even when violently jolted.

Model 400

Long handle electrode pusher of Model 200 easily operated from top, side or bottom of pipe. Electrode pusher designed to let the spring electrodes travel freely, forward or backward, without change or adjustment.

Model 200

For lease or sale—write

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or injury to competing fuel industries." When these are out the Purtell subcommittee of Senate Interstate and Foreign Commerce may take action on the proposed amendments to the Natural Gas Act.

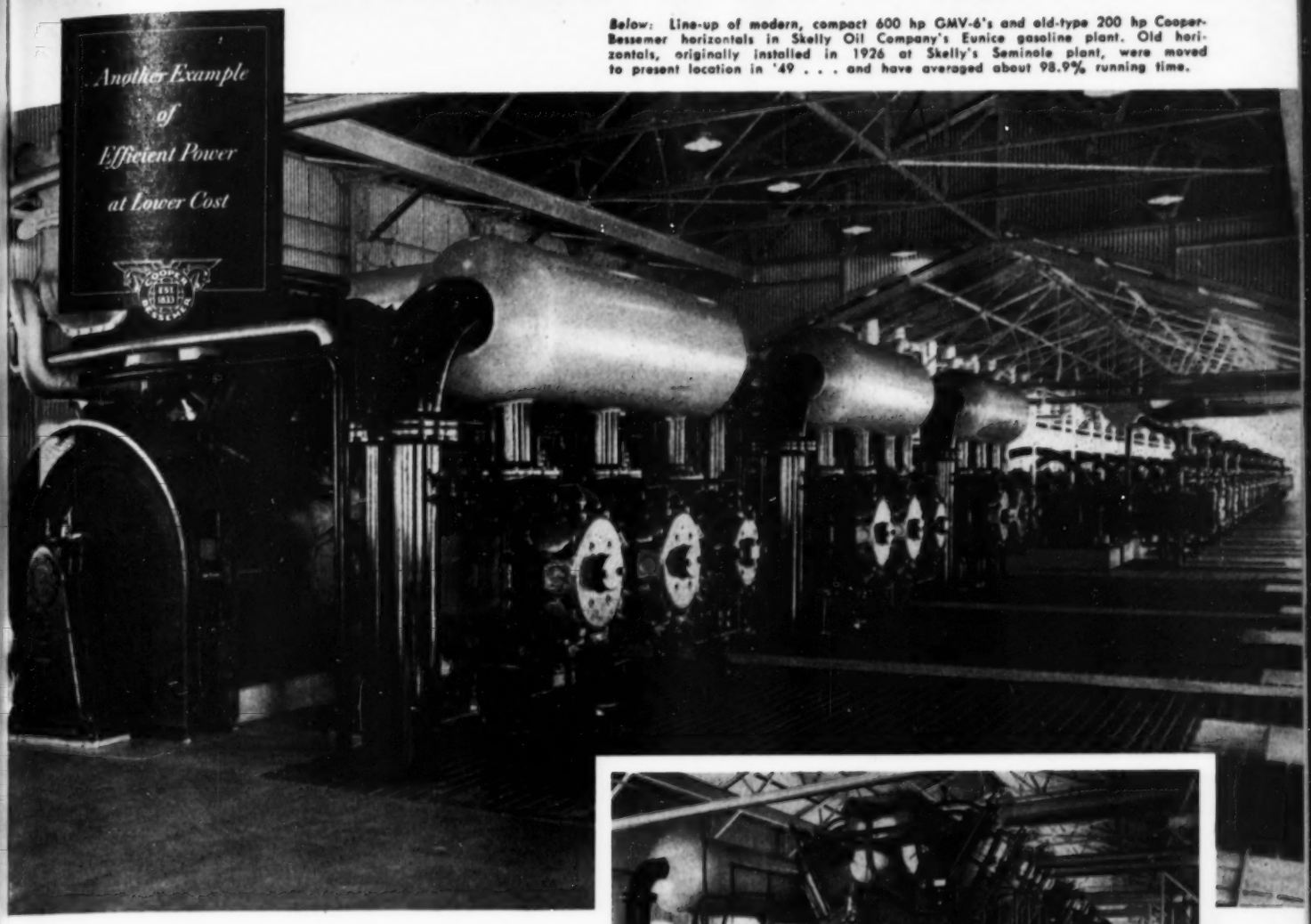
Construction will begin immediately on the Mississippi River Fuel Corp.'s new $15 million ammonia plant to be erected on a 4700-acre site near Crystal City, Mo., 35 miles south of St. Louis. William G. Marbury, president, has announced that the prime contract has been awarded to the Fluor Corp. Ltd., Los Angeles. Mississippi River expects to be supplying its fertilizer industry and industrial accounts by early 1956.

Oral argument previously scheduled for Sept. 9 in Washington on the FPC's consideration of the desirability of adopting rules concerning automatic escalation and favored nations clauses has been postponed until Sept. 30.

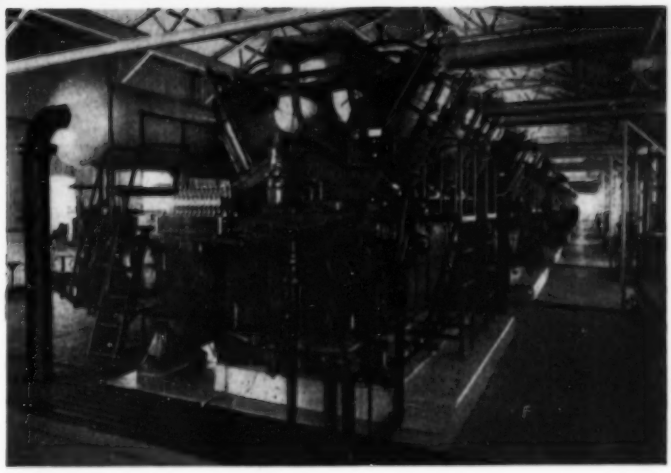
Authorization has been granted the El Paso (Texas) Natural Gas Co. by the FPC for construction of a 32.5-mile line to enable it to purchase and acquire 20 MMcf of gas daily from Barnhart Hydrocarbon Corp. in Reagan county, Texas. The company will also build a metering station. Total estimated cost of the job is $798,603.

Plans by eight east Arkansas towns to build and lease natural gas distribution systems to Mid-South Gas Co. have been approved by the Arkansas Public Service Commission. (See June GAS, page 122.) The approval order went to Turrell, Tyronza, Crawfordsville, Parkin, Earle, Trumann, Lepanto, and Marked Tree.

LaGloria Corp. of Corpus Christi has been acquired by La Gloria Oil & Gas Co., a new company formed by the officers and key personnel of the older firm. LaGloria Corp., which was formed in 1940 as an oil and gas producing firm, will be dissolved. Principal officers of the new company are John F. Lynch, president; T. S. Scibienski, vice president; Paul R. Haas, vice president and treasurer; and Binford Arney, secretary.



Below: Line-up of modern, compact 600 hp GMV-6's and old-type 200 hp Cooper-Bessemer horizontals in Skelly Oil Company's Eunice gasoline plant. Old horizontals, originally installed in 1926 at Skelly's Seminole plant, were moved to present location in '49 . . . and have averaged about 98.9% running time.



Right: This line-up of 7 GMV's includes the three 6-cylinder units shown in the large photo, plus 4 very recently added 1350 hp GMV-10's. Modern GMV's in the Eunice plant now total 7200 horsepower.

IN SKELLY NATURAL GASOLINE SERVICE

..a 27-year line-up of C-B compressors

THE compressor line-up in the big photo above includes modern GMV's and 27-year-old horizontals. Today both types, totaling over 10,000 horsepower, are working side by side in Skelly Oil Company's Plant #2 at Eunice, New Mexico.

The photo reveals a significant contrast in space requirements. The old horizontals, 19 of them extending to the vanishing point, produce 200 hp per unit. But the compact new GMV's, actually occupying less space, are rated 600 hp—3 times as much power per unit. And what's more, today's GMV's, unmatched in thermal efficiency, consume less than 7500 B.T.U. per horsepower hour!

Check up on any and all factors . . . compactness, efficiency, service life, installation cost, maintenance, supervision, etc., . . . you'll find Cooper-Bessemer V-angles your best bet for lowest cost compressor service.

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Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash.
Shreveport, La. St. Louis, Mo. Los Angeles, Calif. Gloucester, Mass.
Tulsa, Okla. New Orleans, La.

DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS • HIGH PRESSURE LIQUID PUMPS

Progress Reports

NEW CONSTRUCTION PLANNED

TEXAS GAS PIPE LINE CORP., Houston. Docket G-2406 for 1600-hp compressor station, meter station, and check meter, and 2½ miles of 12-in. line in Cameron parish, La., to connect with Transcontinental's line.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-2405 for 25-mile, 12-in. lateral line and meter station in Cameron and Calcasieu parish, La., to get additional gas in Orange, Chambers, and Jefferson (Texas) counties.

CURRENT CONSTRUCTION

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2269 for 49.5 miles of 20-in. line from Morton county, Kan. to Hooker, Okla.; dehydration plant and expansion of gathering system in Morton county and delivery meter station in Hooker. 20 miles completed, balance in July.

GULF INTERSTATE GAS CO., Houston. Docket G-2058 to construct 860 miles of 30-in. line from Rayne, La. to Boyd county, Ky., 229 miles lateral lines and five 8000-hp compressor stations in four states. Mainline contracts let to H. C. Price and Houston Contracting Co. Lateral line contracts let to Anderson Bros., Associated Pipe Line Contractors and Williams Bros. Line to be in service Nov. 1, 1954. Over 700 miles of 30-in. line completed.

MISSOURI PUBLIC SERVICE CO., Warrensburg. Mid-States Construction Co. was scheduled to begin work May 15 on 25 miles of 10-line [illegible] from Warrensburg to Clinton.

NATURAL GAS PIPELINE CO. OF AMERICA, Chicago. Docket 2282 for additional hp [illegible] Hooker, Okla. station and 2750 ft of 24-[illegible] line connecting station. R. H. Fulton at [illegible] on line.

OHIO FUEL GAS CO., Columbus. Docket G-22[illegible] Studying bids or bids out for 7.5-mile 16-[illegible] Berlin Heights to Norwalk; 6.6-mile, 16-in. [illegible] Kenton; 11-mile, 20-in. and 10.5-mile, 16-[illegible] New Riegel to North Baltimore. 13.3-mile [illegible] 16-in. replacement North Baltimore to Bowl[illegible] Green.

PACIFIC GAS & ELECTRIC CO., San Francis[illegible] Docket G-2102 to build about 200 miles of 3[illegible] in. mainline loops and add 2500-hp compres[illegible] capacity to company's 500-mile Topock-Milpit[illegible] line. Pipeline work under contract to Engine[illegible] Ltd. Pipeline Co. Compressor to Bechtel Co[illegible] Project to be completed in 1954. Ninety-thr[illegible] miles 34-in. loop now in operation. Associa[illegible] construction of 7.2-mile, 30- and 34-in. a[illegible] 1.9-mile, 22- and 24-in. between Milpitas a[illegible] Irvington proposed for 1954 construction.

SOUTHERN NATURAL GAS CO., Birmingha[illegible] Docket G-1907. About 250 miles various si[illegible] line and 4400 hp compression remaining [illegible] construction in 1954 and 1955. Construct[illegible] on 100 miles of 18-in. underway.

TRUNKLINE GAS CO., Houston. Docket G-2[illegible] for two 24-in. Mississippi river crossings in [illegible] Greenville, Miss. area. Also 26-in. interconne[illegible] ing lines to link new crossing with compan[illegible] system. Missouri Valley Dredging Co. at w[illegible] on job.

APPROVED

EL PASO (TEXAS) NATURAL GAS CO. Do[illegible] G-2371 for 13.3 miles of line, 1540 hp compr[illegible] sion, purification and dehydration plant, [illegible] metering facilities in Lea county, N. M.

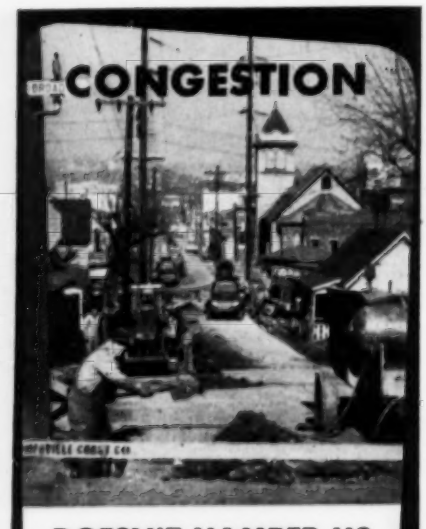
NORTH DAKOTA NATURAL GAS TRANSM[illegible] SION CO., St. Paul, Minn., for 500-mile line[illegible] North Dakota to include 78 miles, 12-in. fr[illegible] Tioga to Minot; 240 miles, 10-in. from Minot[illegible] Fessenden, Tokio, and Grand Forks; 15 mi[illegible] 8-in. from Tokio to Devils Lake; 70 miles, 6-[illegible] from Fessenden to Jamestown; 95 miles, 10-[illegible] from Jamestown to Fargo; 45 miles, 6-in. fr[illegible] Fargo to Wahpeton. Also includes storage, [illegible] proved if company meets certain specificati[illegible]

PACIFIC NORTHWEST PIPELINE CORP., Ho[illegible] ton. Docket G-1429 for 1466 miles mainli[illegible] 380 miles of spur and lateral lines; and 16 co[illegible] pressor stations totaling 104,420 hp, to ex[illegible] from Ignacio, Colo., in the San Juan basin[illegible] Bellingham, Wash. (Seattle area).

CONTRACT LET

TENNESSEE GAS TRANSMISSION CO., Houst[illegible] Docket G-1969 for permission to carry gas [illegible] Iroquois Gas Corp., Buffalo, to export gas [illegible] Niagara Gas Transmission Ltd., Toronto, and [illegible] construct 904 miles of line—571 mile, 36-[illegible] from Kinder, La. to Portland, Tenn.; 63 m[illegible] of 26-in. loop in Ohio; 45 mile, 20-in. line fr[illegible] Buffalo to U. S.-Canadian border; 58 mile, 20-[illegible] line from Gulf Coast to Kinder station; and [illegible] miles of laterals in Texas; 17,520 hp additi[illegible] at existing stations; 6600 hp in one new stat[illegible] Contracts let to Morrison Constructors In[illegible] Anderson Brothers Corp., Houston Contract[illegible] Co., Oklahoma Pipe Line Constructions, Wes[illegible] Pipe Line Constructors Inc., and Panama-[illegible] liams Co. for Kinder, La. to Portland Tenn. [illegible]

TEXAS EASTERN PENN-JERSEY CORP., Sha[illegible] port. Docket G-2341 to construct 265 mile[illegible] 24-in. line from Oakford storage field (Pa.) [illegible] Texas Eastern Transmission Co.'s Lambert[illegible] N. J., compressor station; a 3300-hp compr[illegible] station near storage field. Parkhill Truck [illegible] hauling, stringing, and unloading approxim[illegible] 96-miles 24-in. pipe from Mt. Union, Pa.[illegible] Duncannon, Pa., and Blairsville, Hunting[illegible] Pa. Williams-Austin Co. and H. C. Price [illegible] are contractors.



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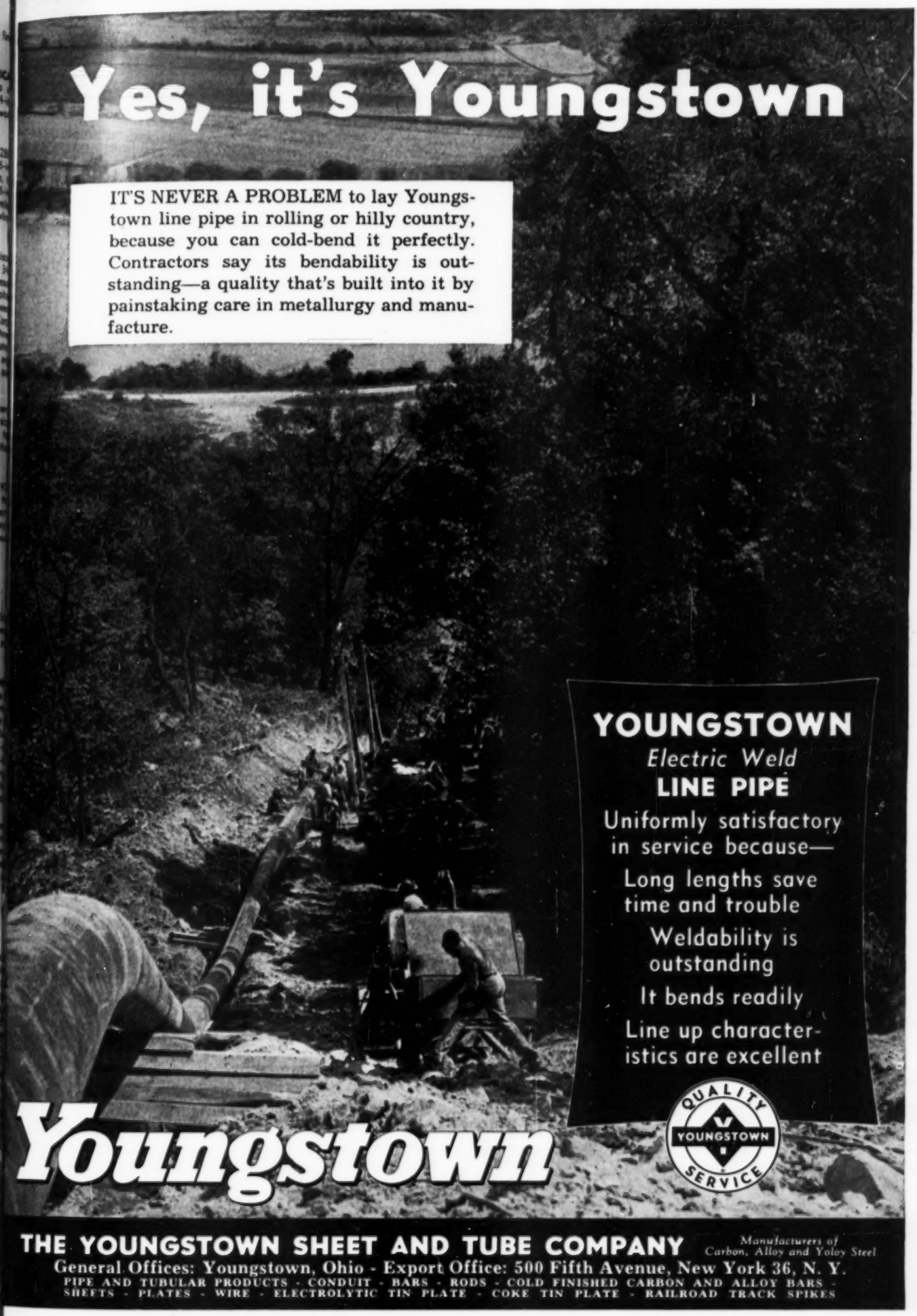
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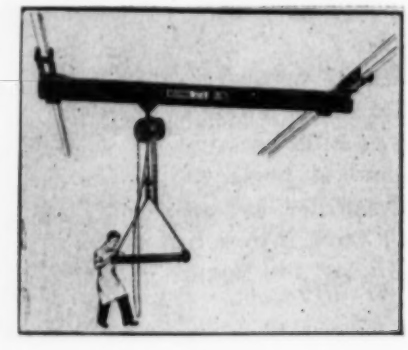


15 Push-tpye Crane

Industrial Crane & Hoist Co.'s new expanded line of push-type cranes includes a light model available in five different capacities and heavy-duty models available in seven capacities.

The heavy-duty models feature smooth performance and ease of operation because of precision manufactured end trucks. The underhung heavy-duty cranes are equipped with forged steel wheels with removable head axles.

All Industrial heavy-duty push-type cranes are available in various spans and can be equipped with hand-operated or electric hoists.

Industrial Crane & Hoist Corp.

■

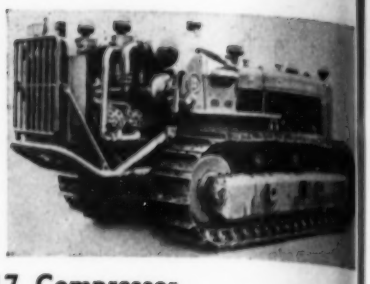
16 Coating Device

Roskoter, a new pipeline coating device designed specifically for applications of its Roskote cold-applied mastic has been introduced by Royston Laboratories.

The Roskoter is a hollow cylinder that can be fitted around any size pipe up to 12 in. Interchangeable coating shoes lined with special, heavy-duty carpets are secured to each end of this cylinder. Adjustable drawbands control film thickness of the coating

The Roskoter provides a smooth, uniformly distributed coating around the entire circumference of the pipe. One man can operate the Roskoter on smaller pipe and only two are needed on pipe up to 12 in. It is available in three sizes: small, medium and large. Each size unit can be fitted with coating shoes for different diameters of pipe.

Royston Laboratories Inc.



17 Compressor

By mounting the LeRoi 600 CTM (com pressor tractor mounted), with side boom and twin wagon drill air feed assembli on a "tractionless" tractor, retired tract can be converted into fast moving, integr drilling units.

Standard equipment on the 600 CTM in cludes an independent clutch to disengag compressor from power take-off shaft, de crank case for operation at 30° angle, com plete compressor controls including slo down of engine, heavy undercarriage, an intercooler guards, air receivers, and heav duty oil bath air cleaners.

LeRoi Co.

■

Trade Literature

18 Coating Manual

The Somastic division of H. C. Price C has just published an illustrated manua "Hevicote and the Marine Pipeline Cros ing," which should be of value to the pipe line engineer concerned with a marine cros ing. Tables and charts are the book's mai features.

H. C. Price Co.

■

19 Valve Comparison Chart

A new valve comparison chart, listin valve figure numbers of 15 major manu facturers and the OIC equivalent valve fig ure numbers, has been release by Ohio In jector. The chart compares gate, globe, check and angle valves in bronze, iron cast steel and forged steel. In handy booklet form, th chart listing is broken down to include de criptions of various valve lines. Data in the chart have been obtained from the latest available valve manufacturers' catalogs.

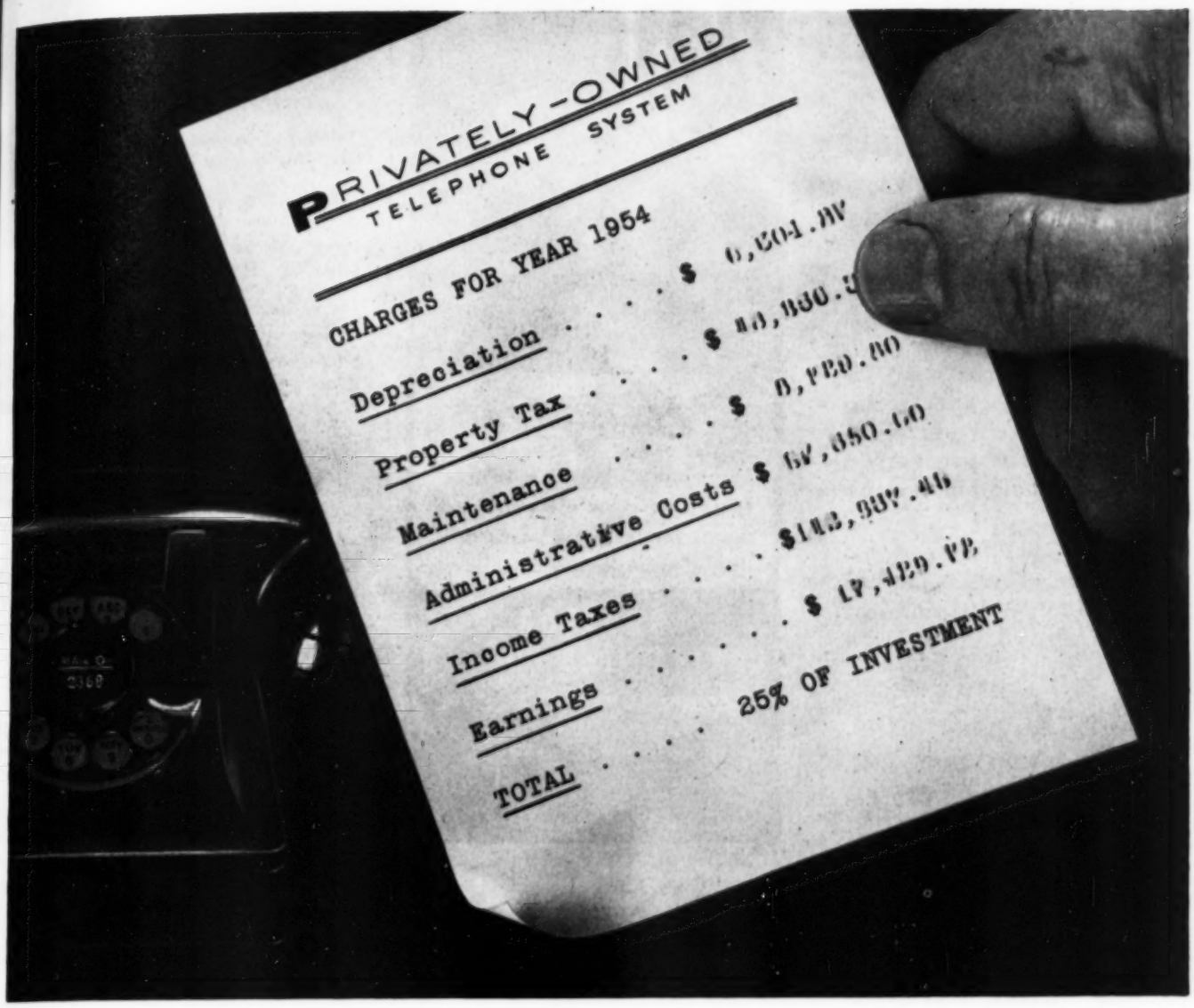
Ohio Injector Co.

■

20 Pipe Wrap Brochure

Blue flag glass fiber underground pipe wrap is described in a new four-page bro chure released by Glass Fibers Inc. The fold er describes the function of the bonded mat material in reinforcing enamel coatings tha are applied to underground oil and ga transmission lines to prevent corrosion. The illustrated folder contains test data on pen tration ratios for reinforced and unrein forced enamels.

Glass Fibers Inc.



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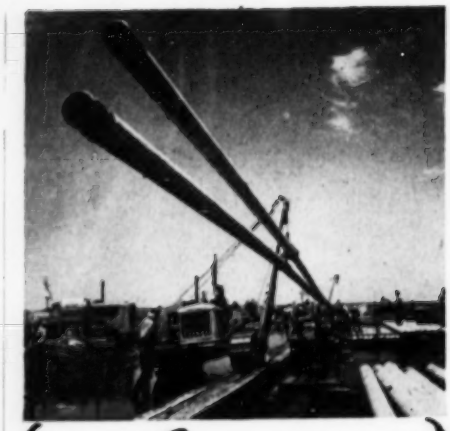

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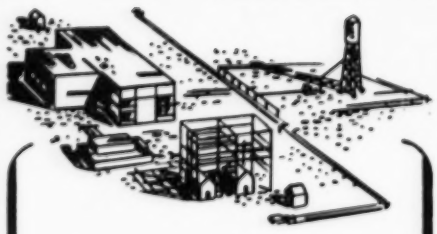

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Pipeline People

GERVAIS F. FAVROT, a New Orleans contractor, has been appointed to the board of directors of United Gas Corp.

ELMORE R. TORN has been named assistant to the vice president and general counsel of the Transcontinental Gas Pipe Line Corp., Houston.

C. E. BUCHNER has retired as executive manager of the Independent Petroleum Association of America and I. C. HUFF JR., assistant executive manager, will succeed him.

PAUL CONNOR, acting district geologist, has been put in charge of the newly established east Texas district geology office of the Arkansas Louisiana Gas Co. LEONARD JORDAN, geologist, and SAM TALBOT, scout, have also been assigned to the Tyler office.

GUY L. MORRILL, manager of the company's Los Angeles plant, has been elected vice president of the Midwest Piping Co. Inc., St. Louis.

ROBERT F. LAY, chief engineer of Cooper-Bessemer Corp.'s production division, has been appointed assistant general sales manager of the Mt. Vernon, Ohio firm. EUGENE L. MILLER, former supervisor of application engineering, becomes assistant general manager.

R. F. Lay

E. L. Miller

Cooper-Bessemer

HOWARD N. WIEST, chief gas dispatcher for the Michigan-Wisconsin Pipe Line Co., Detroit, has retired after 31 years of service in the American Natural Gas Co. system. He served 26 years with Michigan Consolidated Gas Co.

FRED C. FOY, vice president and general manager of the Tar Products division of Koppers Co. Inc., Pittsburgh, has been elected a member of the board of directors.

E. W. THEILIG has been named chief engineer of Worthington Corp.'s power pump engineering department with headquarters at the Oil City (Pa.) works. R. K. GROSHOLZ is manager of the reciprocating pump sales section at Oil City.

LEWIS M. POE has been elected corporate secretary of Colorado Interstate Gas Co., Colorado Springs. Other elections include

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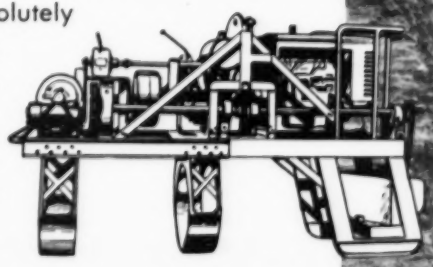

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Williamson, Inc., T. D. 116

Youngstown Sheet & Tube Co. 127

Zinder & Associates, Inc., H. 87

PETER J. KING, THOMAS L. PELICAN, and W. J. FOUNTAIN, assistant secretaries; and J. D. JONES and JOHN YEONOPOLUS, assistant treasurers.

The chemical and gas department of the engineering and construction division of Koppers Co. Inc. has promoted C. W. FISHER to assistant manager of the department, succeeding DR. A. J. ABRAMS, who resigned. J. S. JOSEPH, succeeding Mr. Fisher, is chief of project and technical section; G. A. OMOHUNDRO succeeds Mr. Joseph as assistant chief; and J. M. AIRGOOD, process engineer, succeeds Mr. Omohundro as process engineering supervisor.

WILLIAM L. STANTON, formerly superintendent of gas supply, has been named manager of the Texas Gas Transmission Corp. gas supply department with offices at Shreveport. MONTY G. MARTIN is now chief geologist for the gas supply department.

W. L. Stanton
TGT

R. B. Scott
Cooper-Bessemer

R. B. SCOTT has been put in charge of the newly opened branch office of the Cooper-Bessemer Corp. in Minneapolis. In addition to the Minnesota area, the new office will cover the rapidly developing oil and gas field in North and South Dakota. Cooper-Bessemer has also announced that THOMAS E. EAGAN, chief metallurgist, has been awarded the Joseph S. Seaman Gold Medal by the American Foundrymen's Society.

LEW E. WALLACE, assistant vice president in charge of sales for the Youngstown (Ohio) Sheet & Tube Co., retired recently after 39 years of service.

MEL MADDOX has joined Perrault Equipment Co., Tulsa. He was formerly with Pittsburgh Coke & Chemical Co. and Reilly Tar & Chemical Corp.

S. LEROY MILLER, 46, superintendent of accounting for Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co. and affiliated companies, died June 9 in Chicago of a cerebral hemorrhage.

One of the pioneer employees of the company, Mr. Miller joined it as an engineering clerk in 1930. During his more than 23 years of service he was a clerk, accountant, chief accountant and chief auditor before assuming the duties of superintendent of accounting.